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HUGHES (W. A.) & LISTER (C. A.). **Lime Dieback in the Gold Coast, a Virus Disease of the Lime, *Citrus aurantifolia* (Christmann) Swingle.** —*J. hort. Sci.* 28 no. 2 pp. 131–140, 1 pl., 17 refs. London, 1953.

Limes (*Citrus aurantiifolia*) are common throughout the Gold Coast and are grown commercially over a small area north of Cape Coast. A severe die-back of the trees was observed in 1938, and by 1947 many were dead and it was almost impossible to grow limes from seed in the open. The condition was found to be due to virus infection and two strains or separate viruses were involved, the commoner (die-back) causing clearing and flecking of the leaf veins, followed by die-back of the bark and young twigs, and the other (little leaf), clearing and flecking of the leaf veins and stunting of leaves and twigs but rarely die-back. In experiments, no transmission followed sap inoculation, but both types of the disease were transmitted to lime by grafting with twigs from infected plants, and transmission was also obtained by grafting with bark from stocks of several *Citrus* varieties carrying infected lime. At Asuansi, varieties of sweet *Citrus* budded on sour-orange stocks suffer from a condition resembling tristeza or quick-decline [*cf. R.A.E.*, A 39 307, etc.], and when shoots from several of these were grafted on healthy lime, the symptoms that appeared on the latter indicated that three varieties of sweet orange, a tangerine and a grapefruit were naturally infected with the lime die-back virus. In tests, other varieties of *Citrus* and some other rutaceous plants became infected, some showing symptoms while others, including lemon and rough lemon, were symptomless carriers.

The vector of tristeza is *Aphis citricidus* (Kirk.) [*cf. loc. cit.*], and as this Aphid is common on lime in the Gold Coast, it was tested as a vector of the lime die-back. Lime seedlings infected with the little-leaf strain were used as the source of the virus, and Aphids were allowed to feed on two of them for five and ten minutes, after starvation periods of three hours, and on two others for 1–24 hours without preliminary starvation. They were transferred successively to healthy lime seedlings and allowed to feed for ten days from the time of the last transfer, each test plant receiving a total of 52 Aphids from all the infected plants. Vein clearing appeared on six plants 38 days after the last insect transfer, but later decreased in intensity, until some plants produced symptomless leaves. After six months, two of them showed reduced leaf size and dwarfing and the other four had grown vigorously. Ten healthy seedlings used as controls showed no symptoms. When batches of ten Aphids that had fed on the infected lime seedlings for ten minutes, after starving for three hours, or for 1, 3, 6, 12 or 24 hours without preliminary starvation, were transferred to healthy seedlings, they infected 1, 4, 4, 6, 7 and 26 of 9, 7, 9, 10, 10 and 29, respectively, whereas control Aphids transferred from rough lemons in the nursery to healthy plants infected 15 of 76. Symptoms appeared about a month after the transfers.

Ferrisiana (Ferrisia) virgata (Ckll.), which has been recorded as a vector of swollen-shoot on cacao [*cf. 39 47*], and occasionally occurs on lime, was also tested as a vector. Examples of this mealybug that were allowed to feed on the infected lime seedlings for 30 hours and then on eight healthy ones for 12 days infected six of these, and mealybugs, half of which had fed for three and half for 24 hours on infected plants infected nine of ten healthy ones. *Aphis maidis* Fitch was tested in the same way but caused no infection, although it appeared to feed on the healthy plants for at least 24 hours.

In a discussion of related diseases, it is pointed out that tristeza has been considered to be caused by the same virus or component of a virus complex as a stem-pitting of grapefruit that occurs in South Africa, which is also

transmitted by *A. citricidus*, and it is suggested that lime die-back in the Gold Coast is caused by a virus or virus complex similar to that causing the other two. Since limes budded on rough lemon about 10–15 years ago retained their vigour in spite of showing leaf symptoms and stem-pitting, moribund seedling limes are being replaced by lime grafted on rough-lemon stocks.

LEIDERMAN (L.) & SAUER (H. F. G.). **A lagarta dos milharais (*Laphygma frugiperda* (Abbott e Smith, 1797)).** [L. *frugiperda* in Maize Fields.]—*Biológico* 19 no. 6 pp. 105–113, 33 refs. São Paulo, 1953. **Resultados preliminares do combate à *Laphygma frugiperda* no milho.** [Preliminary Results in the Control of *L. frugiperda* on Maize.]—T.c. no. 7 pp. 121–126, 1 fig., 14 refs.

In the first paper, the authors review the distribution and food-plants of *Laphygma frugiperda* (S. & A.), describe all stages and the nature of the damage caused by it, and give the results of observations on its bionomics on maize in the field and in the laboratory near São Paulo, Brazil, in 1952–53. The larvae usually appear after rain and were present from November in 1952. Egg-masses collected in the field contained 17–423 eggs, with an average of 179, and those deposited in the laboratory averaged 224, 233 and 209 in February, March and May, the average numbers of eggs laid per female in the same months being 1,572, 1,440 and 1,670, respectively. The larvae hatched in two days in February and five days in May, and the larval stage averaged 25 days in March–April and 23 in April–May. They pupated after a prepupal stage of 2–3 days, and the pupal period averaged 11 days in February, 18 in April and 19 in May. Adults survived for averages of 13·5 and 13 days in April and May, respectively, and there are probably 4–5 generations a year. The larvae were destroyed by *Polybia atra* (Ol.) and *P. occidentalis scutellaris* (White) and parasitised by an unidentified Tachinid.

Methods of control are reviewed in both papers, and an account is given in the second of experiments in 1952–53 on the control of the larvae that enter the hearts of the maize plants. The insecticides tested were aldrin, dieldrin, endrin [cf. R.A.E., A 41 268], DDT, p,p'methoxy-DDT (methoxy-chlor), BHC, lindane [almost pure γ BHC], parathion, chlordane and toxaphene. Treatments were applied three times at intervals of 12–15 days. None of the insecticides proved effective when applied in dusts, and none but DDT showed any promise in sprays, the percentage of plants infested being reduced from 100 for no treatment to 64·68, 6·24, 3·12 and 13·77 by 0·2, 0·5, 0·75 and 1 per cent. DDT, respectively, to 0 by 0·5 and 0·75 per cent. DDT with 5 per cent. miscible white oil, to 13·86 by 0·75 per cent. DDT with 10 per cent. white oil, and to 13·76 and 11·2 for 1 per cent. DDT with 5 and 10 per cent. white oil, respectively.

SANTA MARIA (H. C.) & BRUGNONI (H. C.). **Un eriófido parásito de los cítricos, nuevo para la fauna argentina, *Aceria sheldoni* (Ewing)—(Acarina Eriophyidae).** [A. *sheldoni*, an Eriophyid on *Citrus*, new to the Fauna of Argentina.]—Rev. Fac. Agron. Eva Perón (3) 28 pt. 2 pp. 257–263, 8 figs., 7 refs. Eva Perón, 1952. (With a Summary in English.)

Investigations in 1952 showed that a deformation of the leaves and fruits of lemon that had become increasingly common in parts of the Province of Buenos Aires was due to infestation by *Aceria sheldoni* (Ewing), an Eriophyid that had not previously been recorded from Argentina. The

literature on the damage caused by this mite and its distribution [cf. R.A.E., A 30 429] and on measures of control [40 235] is briefly reviewed.

Luziau (R.). Contribution à la prospection phytosanitaire de l'île de la Réunion.—*Phytoma* 6 no. 46 pp. 16–21; no. 47 pp. 18–19, 10 figs., 4 refs. Paris, 1953.

From observations made in 1950–52, the author gives notes on the pests and diseases of cultivated plants and forest trees in Réunion, together with a few records of stored-product pests there. Polyphagous insects observed included the locusts, *Nomadacris septemfasciata* (Serv.), two outbreak centres of which were found, and *Locusta migratoria capito* (Sauss.), only solitary examples of which were seen; and the ant *Monomorium pharaonis* (L.), which, although not very injurious to plants, constitutes a nuisance in certain parts of the island. The principal pests of sugar-cane were *Sesamia calamistis* Hmps. (*vuteria*, auct.) [cf. R.A.E., A 41 68] (the eggs of which were parasitised by *Trichogramma minutum* Ril., *Tetrastichus atriclavus* Waterst. and *Enicospilus* sp.), *Proceras sacchariphagus* Bojer, *Argyroploce schistaceana* (Sn.), *Aphis maidis* Fitch, *Adoretus compressus* (Weber), and the Coccoids, *Saccharicoccus* (*Trionymus*) *sacchari* (Ckll.), *Aclerda thysanolaenae* Mamet, and *Chionaspis* (*Aulacaspis*) *tegalensis* Zehnt. [cf. 26 501]. *Sesamia calamistis* and *Aphis maidis* also attacked maize. Other pests of crops recorded include *Tetranychus telarius* (L.) on groundnuts, *Cera-taphis lataniae* Boisd. on vanilla, *Xyleborus coffeeae* Wurth [cf. 26 706], *Leucoptera* (*Cemiostoma*) *coffeella* (Guér.), *Gracilaria coffeifoliella* Motsch., *Thliptoceras octoguttale* (Feld.), and *Coccus* (*Eulecanium*) *viridis* (Green), on coffee, *Cratopus ditissimus* Boh., *Macrosiphum* (*Aulacorthum*) *solani* (Kalt.) and *Gnorimoschema* (*Phthorimaea*) *operculella* (Zell.) on potato, Aphids including *Myzus persicae* (Sulz.) and *Macrosiphum solanifolii* (Ashm.) (*euphorbiae*, auct.) on tobacco, *Cosmopolites soridus* (Germ.) on banana, *Aspidiotus destructor* Sign. on coconut, *Papilio demodocus* Esp., *Lepidosaphes beckii* (Newm.) (*citrincola* (Pack.)), *L. gloveri* (Pack.), *Coccus hesperidum* L., *Chrysomphalus ficus* Ashm. (*aonidum*, auct.), and *C. dictyospermi* (Morg.) on *Citrus*, *Vinsonia stellifera* (Westw.) (*pulchella* Sign.), *Batocera rubus* (L.) and *Cryptorrhynchus mangiferae* (F.) on mango, *Ceratitis capitata* (Wied.) on peach, the woolly aphis [*Eriosoma lanigerum* (Hsm.)] and *Pulvinaria* sp. on apple, *Atherigona excisa* (Thoms.) and *C. capitata* on tomato and *Melanagromyza phaseoli* (Coq.) and *Tetranychus telarius* on beans. *Casuarina equisetifolia*, the most widespread forest tree on the island, was attacked by *Celosterna* (*Coelosterna*) *scabrador* (F.) [cf. 36 317], and *Aleurotrachelus* (*Aleurodes*) *trachoides* (Back.) sometimes caused serious injury to the young trees in nurseries. The stored-product pests included *Bruchus* (*Acanthoscelides*) *obtectus* Say and *B. (Callosobruchus) ornatus* Boh. on beans, *Oryzaephilus surinamensis* (L.) and *Calandra* (*Sitophilus*) *oryzae* (L.) on rice, *Trogoderma granarium* Everts on coriander seeds, and *Tyroglyphus* sp. on vanilla capsules [cf. 31 217].

Millaud (R.). Insectes parasites des plantes utiles des Établissements français de l'Océanie.—*Agron. trop.* 7 no. 6 pp. 589–599, 2 figs., 11 refs. Nogent-sur-Marne, 1952.

Notes are given on pests of crops in Tahiti, together with records of a very few elsewhere in French Oceania. The main crops of Tahiti are coconut and vanilla. Coconut is attacked by *Aspidiotus destructor* Sign., which is potentially dangerous but is controlled by parasites [cf. R.A.E., A 9 501];

by *Diocalandra taitensis* (Guér.), which may be concerned in the transmission of the fungus causing coconut stem bleeding disease and can be controlled by cutting off infested parts and painting the wounds with tar, and by burning trees that have been killed by it to prevent the insects from spreading; and by *Graeffea* sp., which is of little importance, and Lepidopterous larvae considered by Lepesme to belong to a species of *Tirathaba*; it is infested by Lepidopterous larvae of another species in Rurutu (Austral Islands) and by *Graeffea lifuensis* Sharp in the Gambier Archipelago. The adults of *Araecerus vieillardi* (Montr.) feed on the capsules of vanilla, causing them to fall, but never destroy a large proportion, and those of *Rhyncogonus nigroaeneus* Van Dyke were observed attacking the leaves of *Cinchona*, particularly *C. succirubra*, during the second fortnight of October in 1948, 1949 and 1950, but they rarely attacked *C. ledgeriana*, the more important species of the two, and did little damage.

Citrus fruits are injured by *Dacus psidii* (Frogg.) in Tahiti and by *D. luteolus* Mall. in Bora Bora (Society Islands). Other insects attacking *Citrus* in Tahiti are *Icerya seychellarum* (Westw.), *Lepidosaphes beckii* (Newm.), which also occurs on *Murraya exotica*, *L. gloveri* (Pack.), *Parlatoria cinerea* Hadden, *Chrysomphalus dictyospermi* (Morg.) and at least two unidentified Aleurodids. The measures used against *I. seychellarum* comprise the destruction of alternative food-plants in and near the plantations and of the ants that foster it and spraying frequently with white oil and nicotine. *L. beckii* feeds on the leaves, fruits and branches and is attacked by Hymenopterous parasites and *Fusarium* sp. These tend to be destroyed by DDT and bordeaux mixture, respectively, and nicotine and white oil should be substituted for the former. *C. dictyospermi* causes similar damage and is controlled in the same way. *P. cinerea*, which infests the old trunks and branches, can be controlled by brushing and by treatment with lime-sulphur, and the Aleurodids by spraying with white oil against the eggs.

Mango is attacked by Lepidopterous larvae including *Argyroploce aprobola* (Meyr.); these feed in the flowers and have been considered responsible for sterility in the damp east and south-east coastal districts of Tahiti, but since control of the larvae did not increase the crop set, a fungus is more probably the cause. The fruits of some varieties are infested by *D. psidii*, and the trees are also attacked by *I. seychellarum* and *Aspidiotus destructor*.

Musa fehi, a species of banana peculiar to the region, is severely damaged by *Cosmopolites sordidus* (Germ.) and was almost eliminated by this weevil, but the introduction of the predacious Histerid, *Plaesijs javanus* Erichson, from Fiji has permitted the tree to spread once again. Avocado is attacked by *D. psidii*, and fig by *Ptychodes trilineatus* subsp. *insularis* Fairm.

Of the local food-crops, taro (*Colocasia*), is attacked by *Tarophagus proserpina* (Kirk.) and an Aphid, probably *Aphis gossypii* Glov., which can both be controlled by spraying with BHC or nicotine and soap, sweet potato by *Euscepes* sp. and *Cylas* sp., and cassava (*Manihot utilissima*) (in Bora Bora) by *Saissetia* sp. Cabbage and tomato are attacked by *Nezara viridula* (L.), *Amarantus* by *Hymenia recurvalis* (F.), egg-plant [*Solanum melongena*] by *Epitrix parvula* (F.) and beans by *N. viridula*, *Empoasca* sp., thrips and *Tetranychus equatorius* McG.

LEES (A. D.). Environmental Factors controlling the Evocation and Termination of Diapause in the Fruit Tree Red Spider Mite *Metatetranychus ulmi* Koch (Acarina: Tetranychidae).—Ann. appl. Biol. 40 no. 3 pp. 449–486, 6 figs., 24 refs. London, 1953.

The following is based largely on the author's summary of this account of laboratory investigations on the factors governing diapause in *Paratetranychus*

pilosus (C. & F.) (*Metatetranychus ulmi*, auct.). *P. pilosus* lays eggs of two types. The summer eggs, which are laid on the leaves of apple or other food-plants, are of the non-diapause type and develop without interruption. The winter eggs, which are deposited predominantly on the bark, enter diapause at the blastoderm stage of development. The females laid eggs of only one type if exposed to constant environmental conditions, and are therefore referred to as "summer" or "winter" females. Diapause was shown to be facultative, and over 70 successive generations of summer females were reared under diapause-preventing conditions, whereas winter females appeared in the first post-diapause generation in response to stimuli that induced diapause.

Three environmental agencies were found capable of evoking diapause, namely, daily period of exposure to light (photoperiod) [cf. R.A.E., A 39 441; 40 400], temperature [cf. 39 441; 40 400] and nutrition [cf. 39 197; 41 169; 42 217]. Mites feeding on undamaged young or mature leaves of apple obtained a plentiful food supply, and the incidence of diapause was then determined solely by photoperiod and temperature. However, if the food supplies were restricted, winter females appeared even when photoperiod and temperature were unfavourable for diapause. Such nutritional deficiencies, which are probably of a quantitative nature, were manifested when the diet consisted of senescent leaves or "bronzed" foliage previously damaged by the feeding of large populations of the mite.

At a medium temperature (about 15°C. [59°F.]), only winter females were produced when the daily photoperiod was 6–13 hours. Summer females became more numerous as the photoperiod increased and comprised the whole of the population at a photoperiod of 15–16 hours or more. They also became more numerous as it decreased and comprised about 40 per cent. of the total produced in the absence of light. The mites responded to the absolute duration of the photoperiod and not to the rate at which it was increased or decreased, and the response was independent of light intensity above a threshold of 1–2 foot-candles. Radiation in the blue and, to a less extent, the near ultra-violet and blue-green regions of the spectrum eliminated diapause, but the orange, red and infra-red regions, with wave-lengths above 550 μ , had no influence, even when the energy level was high. The mites were affected directly by the photoperiod, and not indirectly through the food-plant.

A high temperature (25°C. [77°F.]) tended to prevent diapause, even when the photoperiod was favourable for it, and a low one (10°C. [50°F.]) induced some diapause, even with a long photoperiod. The influence of temperature appeared to be mainly confined to the dark phase of the illumination cycle. Developing mites were not affected by photoperiod, temperature or nutrition until they reached the deutonymphal stage, which was the period of greatest sensitivity, but females producing eggs of one type could be induced to produce those of the other by exposure to antagonistic conditions. Eggs intermediate in character were sometimes laid during the period of transition.

Winter eggs in diapause did not hatch when kept constantly at 25 or 18°C. [64·4°F.]. Diapause was broken by chilling the eggs at 1, 5 or 9°C. [33·8, 41 or 48·2°F.] for 150–200 days, and light [cf. 42 181] appeared to have no influence on hatching.

In limited experiments with *Tetranychus telarius* (L.), in which diapause occurs in the adult, photoperiod, temperature and nutrition were found to play a similar part in controlling its onset. Females in diapause could be induced to feed and oviposit by chilling. The tropical species, *Paratetranychus* (*Metatetranychus*) *bioculatus* (W.-M.), did not enter diapause, and photoperiod was without influence on its developmental cycle.

It is concluded that in orchards in which populations of *P. pilosus* remain small throughout the season and damage to the foliage is slight, winter females appear while food supplies are still plentiful as a response to the shorter photoperiod. When damage is severe early in the season, nutrition becomes the dominant factor, and winter females are produced in early generations [cf. 40 141].

LEES (A. D.). **The Significance of the light and dark Phases in the photoperiodic Control of Diapause in *Metatetranychus ulmi* Koch.**—*Ann. appl. Biol.* 40 no. 3 pp. 487–497, 2 figs., 10 refs. London, 1953.

The following is almost entirely the author's summary. The daily cycle of illumination is one of several agencies that control the onset of diapause in *Paratetranychus pilosus* (C. & F.) (*Metatetranychus ulmi*, auct.) [cf. preceding abstract], and both the light and the dark phases are concerned. In laboratory experiments, a long light phase tended in general to suppress and a long dark phase to induce a diapause. In any combination, the path of development was decided by the balance between diapause-preventing (light phase) and diapause-inducing (dark phase) stimuli. However, as the effectiveness of the phases did not increase linearly with duration, the existing balance changed with absolute phase duration, and not with the ratio of light to dark.

The effectiveness of the light phase in suppressing diapause increased most rapidly when it lasted between eight and 16 hours; that of the dark phase rose very sharply when it lasted between eight and 12 hours. Longer dark periods of up to several days' duration also induced diapause, but were no more effective than a 12-hour phase. The inclusion in the cycle of very long periods of light or darkness may also influence diapause by reducing the number of complementary phases experienced by the mite during the sensitive period of development [cf. preceding abstract]. *P. pilosus* was shown to be highly insensitive to the interruption of effective light and dark phases by short intervals of darkness or light—a further indication of the slow inception of the light- and dark-phase reactions.

The findings are discussed with reference to a hypothetical mechanism involving cumulative synthesis and removal of some active substance, but it is concluded that they cannot be fully reconciled with a simple hypothesis of this kind.

TATTERSFIELD (F.), KERRIDGE (J. R.) & TAYLOR (J.). **The Effect of repeated Spraying of Insects in increasing their Resistance to Insecticides.**
I. Development of Resistance to DDT in a Strain of *Drosophila melanogaster* Meig.—*Ann. appl. Biol.* 40 no. 3 pp. 498–522, 8 graphs, 24 refs. London, 1953.

An attempt was made to raise a resistant stock of *Drosophila melanogaster* Mg. by spraying the adults of successive generations with DDT and rearing from the survivors. The original stock was derived from a wild strain and was first acclimatised to laboratory conditions by being reared through several generations by a method similar to one already described [R.A.E., A 42 253]. The adults were lightly anaesthetised before spraying to facilitate handling, and carbon dioxide was at first used for this purpose, but as the flies later became sensitive to this gas [see next abstract], it was replaced by nitrogen. Selection of a strain less susceptible occurred within a few generations among a stock sprayed with 0·01 per cent. DDT, which gave an initial mortality of 93 per cent., but there was no marked selection in a stock sprayed with 0·0075 per cent. DDT, in which initial mortality was

only 61 per cent. Resistance fluctuated considerably in all the stocks, whether they were sprayed with DDT at any concentration, or with the carrier alone or were untreated, and there was some indication in the series sprayed with 0·01 and 0·015 per cent. DDT, of a rhythm with peaks of susceptibility occurring every seven generations. Stocks sprayed with 0·01 per cent. DDT showed no lethal effect after 16 months. Comparison of the log-probit dosage-mortality curves for stocks treated over a period of about a year with DDT at 0·01 per cent., at 0·0075 per cent., or at 0·01 per cent. in the earlier generations and 0·015 per cent. in the later ones, or with the carrier alone, showed that the repeated spraying had resulted in a change in slope, which was probably temporary and represented an initial effect due to a change in the distribution of resistance in the stock, and a change in the value of the median lethal concentration. After a further five months, the level of resistance, as demonstrated by log-probit dosage-mortality curves, was the same whether the concentration of DDT remained at 0·01 per cent. throughout or whether it was increased progressively from 0·01 or 0·015 to 0·05 per cent. It is concluded that the higher the initial mortality the more rapid the selection, and that though subsequent increases in the concentration of the toxicant may accelerate the development of resistance, the end-point achieved, as judged by the median lethal concentration, depends apparently upon the content of resistant strains in the initial population.

The rate of respiration in resistant strains was found to be the same as in non-resistant ones in the case of males and greater by an amount that was just significant in females [cf. B 40 57]. B. J. Harrison examined the stock selected at 0·01 per cent. DDT and found a higher average number of spermathecae than in the unselected stock.

TATTERSFIELD (F.) & KERRIDGE (J. R.). The Effect of repeated Spraying of Insects in increasing their Resistance to Insecticides. II. The Effect of Carbon-dioxide Sensitivity on the Toxicity of DDT within a Strain of *Drosophila melanogaster*.—Ann. appl. Biol. 40 no. 3 pp. 523–536, 4 figs., 7 refs. London, 1953.

The following is virtually the authors' summary. During the selection of a stock of *Drosophila melanogaster* Mg. for resistance to DDT, in which carbon dioxide was used for purposes of anaesthesia [see preceding abstract], a sensitivity to this gas developed. The phenomena closely paralleled those shown by the CO₂-sensitive ebony stock isolated by L'Héritier and his co-workers [cf. R.A.E., A 42 253]. An experimental analysis of its effect upon DDT-sensitivity was made. It was found that a stock selected for CO₂-resistance gave the same probit regression line as the original stock. A CO₂-sensitive stock, whether anaesthetised with nitrogen or carbon dioxide, gave the same regression line at a temperature of 25°C. [77°F.], at which CO₂-sensitivity disappeared, as at 15°C. [59°F.] if adjustment to the proportion of deaths in the control was made. The effect of CO₂ was therefore to limit the population from which selection is made for DDT-resistance, rather than to alter the distribution of DDT-resistance within the stock.

WATSON (M. A.) & NIXON (H. L.). Studies on the Feeding of *Myzus persicae* (Sulz.) on radioactive Plants.—Ann. appl. Biol. 40 no. 3 pp. 537–545, 2 graphs, 9 refs. London, 1953.

The following is substantially the authors' summary. Adult apterae of *Myzus persicae* (Sulz.) were fed, after a period of fasting, on the leaves of

turnip or sugar-beet seedlings growing in a radioactive water-culture solution containing P^{32} as orthophosphoric acid or on detached leaves of turnip or tobacco that had been immersed for three days in the radioactive solution. The weight of sap imbibed by the Aphids after varying feeding times was estimated by relating their radioactivity, at the end of each feeding period, to the activity per unit fresh weight of the leaf lamina on which they fed. The calculations were made on the assumption that P^{32} is uniformly distributed in the leaf tissues.

The mean rates of uptake of the sap in mmg. per hour so estimated [cf. R.A.E., A 42 215] were about 10 for the first hour of feeding, 40 for 1-4 hours of feeding, and 17 for 6-24 hours of feeding. The decrease in apparent rate of uptake with the longer feeding times is attributed to loss of P^{32} in nymphs produced during the feeding period.

When Aphids were fed on seedlings growing in the radioactive culture solution, no activity was detected after five minutes of feeding and an insignificant fraction after 15 minutes, but Aphids that fed for five and 15 minutes on leaves that had been immersed in the culture solution became appreciably radioactive.

The increase in rate of uptake after one hour of feeding indicates that Aphids do not feed normally until they reach the phloem, but the activity after short feeding times suggests that previously starved Aphids feed to some extent on other tissues, though possibly only on the epidermis.

JONES (G. D. G.) & THOMAS (W. D. E.). **Experiments on the possible Contamination of Honey with Schradan.**—*Ann. appl. Biol.* **40** no. 3 pp. 546-555, 11 refs. London, 1953.

Previous findings that the toxicity of schradan, at least as a contact poison, to honey bees is low [cf. R.A.E., A 39 345] were confirmed in tests in which its effects as a stomach and a contact poison were investigated in the laboratory by methods described in a paper already noticed [40 198] and by determining the mortality among bees exposed to a dry deposit for an hour and subsequently kept for 24 hours at 30°C. [86°F.], which approximates to the temperature within the hive, and a relative humidity of 65 per cent. The percentage mortality varied from 10 at a rate of 50 mmg. schradan per bee to 100 at 250 mmg. in the stomach-poison tests and from 0 at 3·1 mmg. per sq. cm. to 35 at 65 mmg. in the tests of spray contact action, and exposure to 0·06 mmg. per sq. cm. in a dry film gave 7 per cent. mortality. The corresponding percentages for parathion varied from 0 at 0·005 mmg. per bee to 100 at 0·7 mmg., and from 0 at 0·05 mmg. per sq. cm. to 100 at 0·64 mmg.; all the bees were killed by exposure to 0·0006 mmg. per sq. cm. in a dry film.

The possibility that schradan, owing to its systemic effect, might appear in the nectar of plants was investigated in the glasshouse by spraying white mustard and borage with radioactive schradan while the buds were small. Contamination of the nectar occurred, but samples taken over a four-week period following spraying showed a progressive decrease in total P^{32} content and also in the amount of schradan present in proportion to the decomposition products. The highest figure recorded for the schradan content of the nectar was 21 parts per million. No appreciable breakdown of schradan occurred in the honey stomachs of bees that had fed three days previously on sugar syrup containing the radioactive compound or when a solution of it was added to a filtrate containing the enzyme invertase, obtained by macerating the salivary glands of bees in distilled water. It was also shown that schradan remained stable for 2½ months when mixed with honey.

There is no evidence that crops visited by honey bees are sprayed with

schradan when they are about to flower in Britain, but it is pointed out that subsidiary weed crops may be inadvertently sprayed and honey contaminated as a result.

International Convention for the Protection of Plants and Plant Products.

Rome, December 6, 1951. [In English, French and Spanish.]—Treaty Ser. no. 16 (1954) (Cmd. 9077) 30 pp. London, H.M. Stationery Office, 1954. Price 1s.

The three official texts of the International Plant Protection Convention [R.A.E., A 41 128] are followed by lists of the 11 governments that had ratified it and the three non-signatory governments that had adhered to it by the end of 1953 [cf. 41 287]. The ratification of the Government of the United Kingdom was deposited on 7th September, 1953.

LING (L.). Digest of Plant Quarantine Regulations. First Supplement.—
[3 +] ii + 100 pp., multigraph. Rome, Fd. Agric. Org. U.N., 1954.

This supplement to an earlier publication [R.A.E., A 41 128] contains digests of the laws and regulations governing the importation of plants and plant products in force in 38 additional countries and territories.

HOFFMANN (A.). Contribution à l'étude de *Ceuthorrhynchus assimilis* Payk. (le ceuthorrhynque des siliques).—Rev. Path. vég. 30 fasc. 4 pp. 238–252, 27 figs., refs. Paris, 1951.

The increased cultivation of rape in France has favoured infestation by *Ceuthorrhynchus assimilis* (Payk.), an important pest of various cruciferous seed crops. The author describes the larva, pupa and adult of this weevil, reviews its synonymy, distribution and food-plants, gives a key to its various forms and another permitting it to be distinguished from other species of its genus that infest crucifers, and presents the results of observations on its bionomics, begun in 1936 and carried out chiefly in northern and central France. Local losses of seed crops are recorded as having ranged up to 20–30 per cent. on cabbage and turnip and 70–80 per cent. on radish and were very high on rape, on which up to 90 per cent. of the pods were infested.

The adults appeared towards the end of March or beginning of April in the south and between mid-April and early May in central and northern France, and fed for a few days on the leaves and stalks of various wild and cultivated crucifers before pairing. Oviposition was observed at temperatures as low as 6·5–9·8°C. [43·7–49·64°F.], and the females laid their eggs in the unopened flower buds, choosing in the case of cabbage, radish, rape and turnip those that would open 8–12 days later, and not, as is usually stated, in the young pods [cf. R.A.E., A 40 111, etc.]. The egg stage lasted 7–10 days, and premature opening of the buds probably accounted for the finding of desiccated eggs in some flowers. Oviposition continued for 2–3 weeks, and eggs were found from early April to mid- or late May. Dissected females contained 70–120 eggs each. The larvae entered the pods and began to feed 2–3 days after hatching, and at average daily temperatures of 14·2°C. [57·56°F.] and 24·8°C. [76·64°F.], the larval stage lasted 35–36 and 20 days, respectively. There were usually only two larvae per pod on most crucifers, though five were found on radish. The full-fed larvae entered the soil and pupated after 15–18 days. Some of the adults emerged in late July or early August, after a pupal stage of 25–30 days, and the remainder

not until the following March. Those that emerged in summer fed for a few weeks and then overwintered in the soil or other shelters.

A list is given of the commonest parasites of the weevil. Of those reared by the author, *Diospilus oleraceus* Hal. was the most numerous and *Eulophus hegemon* Wlk. was also common. It is suggested that insecticides applied to the soil just before the adult weevils emerge in late summer might give effective control.

MARTIN (H.). *Observations et essais de lutte contre Ceratitis capitata Wied. en Provence, 1951*.—*Rev. Path. vég.* 31 fasc. 1* pp. 52-62, 6 graphs, 1 ref. Paris, 1952.

Observations on the frequency and control of *Ceratitis capitata* (Wied.) were made in orchards in Provence, an important peach-growing region, in 1951, when infestation was late and slight. Bait-traps were hung in the trees from May onwards, and adults were taken in them between early July and mid-October. Only small numbers were taken on apricot, fig, persimmon or early peaches, but late peaches were more heavily attacked, especially in late August and early September. In one district, full-fed larvae were found in peaches in early July, before any flies appeared in the traps, so that adults must have been present in June. Local variations in the numbers taken are discussed. A comparison of various baits in August-October showed that the total numbers of flies taken and (in brackets) the percentages of females in the catches were 240 (40) and 243 (36) for 3 per cent. crude and pure diammonium phosphate, respectively, 361 (39) for 3 per cent. pure triammonium phosphate and only 183 (33) for the mixture of 10 per cent. molasses and 0.5 per cent. casein recommended by Hanna [R.A.E., A 38 453]. Of the females taken in the traps containing the ammonium phosphates, 22-28 per cent. were sexually mature, as compared with only 6 per cent. for the molasses mixture. The crude diammonium phosphate is considered sufficiently effective for future work.

It is not known whether the fly overwinters in the pupal stage in this area or is imported with infested fruits [cf. 42 184]. It seemed likely that hibernation of the pupae in the winter of 1951-52 would occur only in the few cases in which larvae developed in very late persimmon or peach, as larvae reared from infested peaches in August-October all gave rise to adults before the winter. The Braconid, *Aphaereta minuta* (Nees), was reared from 1 per cent. of the pupae obtained in the second half of September [cf. 40 362].

The experiments on control were carried out on late peaches with proprietary spray products. The infestation percentages on one variety picked in late August or early September were 6.17 for no treatment, 1.15 for 0.25 per cent. wettable DDT applied on 6th August, 0.51 for an emulsion spray of 0.1 per cent. DDT applied on 6th and 24th August, 0.35 and 0.19 for 0.5 per cent. of emulsion concentrates containing 20 per cent. DDT with 5 per cent. Pyrolan (1-phenyl-3-methyl-pyrazoly(5) dimethylcarbamate) and 20 per cent. DDT with 4 per cent. parathion, respectively, applied on 20th August, and 1.1 for a mixture of 0.02 per cent. γ BHC and 0.08 per cent. DDT applied on 21st August. On another variety picked about the same time and sprayed on 24th August, infestation was reduced from 39 to 5 per cent. by 0.4 per cent. of a mixture containing 25 per cent. DDT and 10 per cent. Pyrolan. Infestation on a third variety, picked on 7th-14th September, was reduced from 15 to 3 per cent. by treatments on 6th and 24th August and 4th September with an emulsion spray of 0.1 per cent. DDT, and on a fourth, picked on 10th-24th September, it was reduced from 37 to 6.7 per cent. by applications on 24th August and 10th September, of 0.5 per cent. of the mixture containing 20 per cent. DDT and 5 per cent.

Pyrolan. On a very late variety, picked in September–October, a spray of 0·25 per cent. wettable DDT on 5th September followed by one of 0·1 per cent. DDT in an emulsion spray on 19th September reduced infestation from 30 to 3·2 per cent. It was apparent from the results that DDT gave effective control. Treatment should be applied when the fruits begin to change colour, with a second application 15 days later if harvest is delayed.

SMIRNOFF (W.). *Aspidiotiphagus lounsburyi Berl. et Paoli (Chalcidoidea, Aphelinidae) parasite de certaines espèces de Diaspidoidae (Homopt.) au Maroc.*—*Rev. Path. vég.* 31 fasc. 1 pp. 63–69, 5 graphs, 22 refs. Paris, 1952.

Aspidiotiphagus lounsburyi (Berl. & Paoli), the world distribution and hosts of which are reviewed, was found for the first time in Morocco in 1948, parasitising *Chrysomphalus dictyospermi* (Morg.) on *Citrus* near Rabat, and was observed in 1949–50 attacking various other Diaspines on the same crop, mainly in coastal districts. The nymphs of *Lepidosaphes beckii* (Newm.) were parasitised in the Rabat, Casablanca and Mazagan region, except during July and August, the percentage parasitism being about 20 in January–July and 30 in December, and the nymphs and young females of *Parlatoria ziziphus* (Lucas) were parasitised in the same region, the percentage parasitism of the nymphs averaging 20, except during July and August, and that of the females averaging 10–15 in November–December. In the Oujdja, Berkane and Mediterranean region, young females of *P. ziziphus* were parasitised in the autumn of 1949 and in April–May 1950, but the other stages of *P. ziziphus* and other Coccoids were not attacked and the parasite was not found between June and November. *C. dictyospermi* was parasitised throughout the year near Rabat, the nymphs being attacked mainly in spring and autumn and the females during the summer, parasitism rising to 70 per cent. from July to early September, when *P. ziziphus* and *L. beckii* were not attacked. Other species parasitised by *A. lounsburyi* were *L. gloveri* (Pack.), *Aspidotus hederae* (Vall.), *Hemiberlesia rapax* (Comst.), *P. oleae* (Colv.), *Aonidia lauri* (Bch.) and *L. ulmi* (L.).

In the laboratory, females of *Aspidiotiphagus* laid one egg per host, and the egg, larval, and combined prepupal and pupal stages lasted 3–4, 5–7 and 8–10 days, respectively, at an average temperature of 22°C. [71·6°F.] and a relative humidity of 70 per cent. The adults survived for 3–6 days, and there were 10–12 generations a year. *A. lounsburyi* was the most important of the natural enemies of *L. beckii*, *L. gloveri* and *P. ziziphus* in Morocco, but was less effective against *C. dictyospermi* than other parasites present.

MAGNIN (J.). *Développement et mode de reproduction de Pseudococcus njalensis Laing.*—*Agron. trop.* 8 no. 3 pp. 292–299, 9 figs., 12 refs. Nogent-sur-Marne, 1953.

Pseudococcus njalensis Laing is the commonest of the mealybugs that infest cacao in the Ivory Coast and the Gold Coast. The author gives descriptions of all stages and also of the spermatozoa [cf. R.A.E., A 38 334] from material from the Ivory Coast and states that the species shows some characters of the male common to species of *Planococcus* and does not fit well into the genus *Pseudococcus* as restricted by Ferris [39 140]. In view of its importance as a vector of the virus of swollen shoot [cf. 37 85], *P. njalensis* was reared on cacao beans in the laboratory for determination of its developmental cycle. The temperature was about 27°C. [80·6°F.],

and the humidity close to saturation. The techniques of preparing the beans, rearing the mealybugs and examining specimens are described. The female gave birth to larvae enclosed in a fine membrane; they freed themselves rapidly and moved about in a few minutes. Feeding then began, and the first moult occurred after 9–16 days. Females completed the second and third moults and began reproducing 11–19, 18–26 and 32–40 days after birth, respectively. The males ceased feeding during the second instar and spun cocoons, in which they underwent the last three moults 12–22, 15–23 and 19–25 days after birth, respectively. The females were usually fertilised within two days after the last moult, began to reproduce about a fortnight later, and gave birth to larvae for 5–6 days, dying soon after. The numbers of larvae produced ranged from 24 to 95. Unfertilised females survived for up to 40–45 days, but no embryos developed in them, and it seems probable that reproduction is normally bisexual in the Ivory Coast [cf. 37 87; 39 303]. Males and females occurred in approximately equal numbers both in the laboratory and in the field. In some field colonies, 50 per cent. of the mealybugs were killed in the second instar by a parasite of the genus *Allotropa*.

SKAIFE (S. H.). African Insect Life.— $9\frac{1}{2}$ × 6 ins., viii + 387 pp., 75 pls. (5 col.), 190 figs. Cape Town, London, New York, Longmans Green & Co. [1954.] Price £3 3s.

This book is intended for the general reader and is written in non-technical language. It has special reference to South Africa, and many of the insects selected to illustrate the habits of the various orders and families dealt with are of economic importance there. Much general information on morphology and bionomics is included, and each chapter ends with a section on the classification of the group in question.

MALLIS (A.). Handbook of Pest Control. The Behavior, Life History, and Control of Household Pests.—2nd edn., $9\frac{1}{4}$ × 6 ins., 1068 pp., 231 figs., many refs. New York, N.Y., MacNair-Dorland Co., 1954. Price, post paid, U.S.A., \$9.25; elsewhere, \$9.75.

This edition of a book on the life-history and control of household pests, mostly insects that damage timber, furniture and fabrics, infest stored products or are troublesome in and about buildings in the United States [cf. also R.A.E., B 42 147], resembles the earlier one in scope [A 33 318], but the subject-matter has been greatly extended and the information, especially that on control and the use of insecticides, brought up to date.

LEIDERMAN (L.) & SAUER (H. F. G.). Efeito dos inseticidas no combate à *Heliothis obsoleta* em espigas de milho. [The Effect of Insecticides in controlling *H. armigera* on Maize.]—Biológico 19 no. 8 pp. 137–143, 1 fig., 19 refs. São Paulo, 1953.

The authors briefly review the distribution and food-plants of *Heliothis armigera* (Hb.) (*obsoleta* (F.)) in Brazil, the damage it causes to maize, and work on its control, both there [cf. R.A.E., A 28 225; 32 108] and in the United States, and give the results of experiments carried out near São Paulo in 1952–53 in which sprays and dusts of chlordane, DDT, dieldrin, lindane [almost pure γ BHC], p,p'methoxy-DDT (methoxychlor), parathion and toxaphene and an aldrin dust were applied four times to maize, beginning when 10 per cent. of the silks had appeared. None of the

dusts was highly effective, and the only spray that gave satisfactory results was 0·75 per cent. DDT with 10 per cent. miscible white oil, which in three tests reduced the percentages of infested ears from 60, 79 and 61 to 10, 25 and 14, respectively. In the first test, 1 per cent. DDT in white oil reduced the infestation to 4 per cent., but injured the plants, and injection into the silks of 1 per cent. DDT in a mineral oil (with a viscosity of 76 secs. Saybolt and 93 per cent. unsulphonatable residue) at 0·5 cc. per ear reduced it to 8 per cent., but was uneconomic.

MENEZES MARICONI (F. A.). **O percevejo do abacaxi** (*Lybindus dichrous* Stål, 1859). [The Pineapple Bug (*L. dichrous*).]—*Biológico* 19 no. 9 pp. 155–162, 3 figs. São Paulo, 1953. (With a Summary in English.)

Pineapple in the State of São Paulo, Brazil, is severely injured by *Thecla basilides* (Geyer), *Dysmicoccus (Pseudococcus) brevipes* (Ckll.) and *Paradiaphorus crenatus* (Billb.) [cf. R.A.E., A 38 322–323], and investigations at Piracicaba in 1953 showed that it is also attacked by *Lybindus dichrous* Stål, a Coreid apparently not mentioned in the economic literature since its original description in 1859. All stages are briefly described, and the species is recorded from three other localities in São Paulo and one in Mato Grosso. It has been found in Argentina on pineapples from Brazil, but is not thought to be established in that country. Only plants bearing fruits were attacked. Nymphs and adults occurred during the day on the lower parts of the stalk, from which they sucked the sap, thus preventing the development of the fruit and causing the stalk to dry up or to rot, and at night they were also observed sucking the fruit itself. The eggs were usually laid on the lower part of the stalk, occasionally on the upper part, and rarely on the fruit. The adults were not observed to fly, and dissemination throughout a crop is slow. Infestation began when the fruits appeared, in June–July, and increased until the beginning of the rains, when it fell rapidly. When adults placed on branches were sprayed with 0·25 per cent. DDT or 0·024 per cent. γ BHC in wettable powders or with about 0·02 per cent. parathion in an emulsion spray and then transferred to untreated pineapple plants, parathion gave 80 per cent. mortality in 9·5 hours, with no increase after 24, and BHC gave 60 per cent. mortality in 24 hours, the remaining adults being severely affected in both cases. DDT gave no mortality in 24 hours, but 80 per cent. of the adults were affected.

MENEZES MARICONI (F. A.) & LORDELLO (L. G. E.). **Uma praga florestal** *Arsenura xanthopus* (Walker, 1855). [*A. xanthopus*, a Forest Pest.]—*Biológico* 19 no. 10 pp. 175–181, 7 figs., 4 refs. São Paulo, 1953. (With a Summary in English.)

Luehea divaricata growing in a park at Piracicaba, near São Paulo, was severely attacked in 1950–53 by larvae of *Arsenura xanthopus* (Wlk.). All stages of this Saturniid are briefly described. The eggs were laid in February–March in batches on the lower surface of the leaves of the trees, and the larvae fed on the leaves and pupated in the soil. There was only one generation a year. The parasites observed comprised *Tetrastichus* sp., which destroyed a very high percentage of the eggs, *Winthemia tricolor* (Wulp), which attacked up to 80 per cent. of the last-instar larvae, and *Sarcophaga lambens* Wied., which was of little importance.

In laboratory tests with various sprays, 0·25 per cent. DDT from a wettable powder affected all the larvae within 6·5 hours, but some did not die for up to two days. BHC, toxaphene and parathion were ineffective.

ANDRADE, A. C. & PRATA (D.). Experiências com inseticidas orgânicos para controlar o percevejo castanho *Scriptocoris castaneus* em cana-de-açúcar. [Experiments with organic insecticides for the Control of *S. castaneus* on Sugar-cane.] — *Bladex* 19 no. 10 pp. 187-189, 1 ref. São Paulo, 1953.

In further experiments on the control of *Scriptocoris castaneus* Party on sugar cane in São Paulo [cf. H.A.F., A 41 (21)], begun in March 1952, dusts of 1 per cent. γ -BHC, 10 per cent. toxaphene, 10 per cent. DDT, 0.7 per cent. γ -BHC as lindane, and 10 per cent. chlordane at 36 lb. per acre, and one of 3 per cent. aldrin at 18 lb. per acre, were applied to the open furrows before the planting of the setts, alone or mixed with a fertiliser. By November 1952, germination in the fertilised series was highly significantly improved by treatment with chlordane, lindane or toxaphene, and significantly improved by BHC. Rooting, investigated in February 1953, was significantly better after treatment with chlordane, lindane or toxaphene. All treatments resulted in a significant increase in yield in August. Chlordane, lindane and toxaphene again proving the best. In the non-fertilised series, chlordane, lindane and toxaphene significantly improved germination and rooting, but the increases in yield were not significant.

TAYLOR (E. M.). Some Notes on the Life-history and Habits of *Theraptus* sp. (Coreidae). — *Bull. ent. Res.* 45 pt. 3 pp. 429-432, 1 ref. London, 1954. Some Experiments in Cross-breeding of the Coreid Bug, *Theraptus* sp. — *T.c.* pp. 433-435, 4 refs.

The Coreid that causes premature nutfall of coconuts in Zanzibar is referred to in these papers as *Theraptus* sp. [cf. H.A.F., A 42 (1)], but is stated in a footnote to represent an undescribed genus and species. In insectary studies on its life-history, described in the first paper, complete development lasted for averages of 81.3 and 81 days on coconut seedlings at 24 and 28°C. (75.2 and 82.4°F.), respectively, and 20 days on Lima beans at 28°C. Females survived for an average of 45 days and males for somewhat longer. Oviposition began about eight days after emergence and continued throughout life, the maximum number of eggs being 167 per female. The eggs hatched in nine days at 23.9°C. (about 75°F.) and in six at 29.34°C. (84.2-93.2°F.), but temperatures above 33°C. (91.4°F.) were unfavourable. Although coconuts are the main food plant, the immature fruits of mango, guava, cassia and cassia are also attacked in the field. Attempts to rear the Coreid on papaya, pineapples, wild figs, the pads of leguminous plants other than *Faba*, and various fruits were unsuccessful. Experiments in which nymphs were confined on uninfested coconuts showed that they can develop on nuts of all ages and that one nymph or adult can, in a month, completely destroy a single bearing nut up to three months old. Natural enemies that exert a measure of control include, in addition to the ant, *Crematogaster* sp. [cf. H.A.F., A 42 (1), 123], a Strepsipterous endoparasite that causes sterility in the females, two unidentified Hymenopterous egg-parasites, an unidentified Reduviid and possibly certain small ants, notably *Pheidole megacephala* (F.) that prey on the eggs.

The second paper contains an account of cross-breeding experiments carried out with stocks reared from nymphs originating on coconuts in Zanzibar, Pemba and the Tanga area of Tanganyika to determine whether the Coreids in these localities were specifically distinct. High proportions of fertile eggs were produced from the initial crosses, but females of the F₁ generation that paired with males of the same cross laid fewer eggs with

a higher proportion of infertile ones, and partial sterility may have existed in some cases. It is concluded that only one species is concerned, though there may be local strains.

TALHOKE (A. S.). Further Trials with Parathion Dusts against *Eurygaster integriceps* Put. (Hemiptera, Pentatomidae).—*Bull. ent. Res.* **45** pt. 3 pp. 495–500, 2 figs., 3 refs. London, 1954.

An account is given of further experiments with parathion dusts applied with power equipment mounted on a jeep for the control of *Eurygaster integriceps* Put. on wheat in Syria (*cf. R.A.E.*, A **40** 2–3). In 1951, a dust containing 0·75 per cent. parathion was applied under a drag-sheet to three plots of wheat in a district near the Turkish frontier at rates of about 36, 18 and 9 lb. per acre, respectively, in early May, when the Pentatomids were mostly in the first three instars, and population counts were made 60 and 70 hours later. Comparison with an untreated plot showed that the treatments had reduced infestation by 98·4 and about 83 and 65 per cent., respectively, nymphs in the first two instars being particularly susceptible. In another test, in which dusts of 0·75 or 0·8 per cent. parathion were applied at 27–45 lb. per acre in mid-May, sampling was hindered by wind, but the ground beneath the plot, was covered with dead insects after harvest, and at the highest rate of application the dust was still effective five days after application.

An experiment on a larger scale was carried out in another part of Syria at the end of May 1953, when nearly all the insects were fourth-instar nymphs or adults. Plots of barley and wheat often alternate in this region; the barley is harvested about three weeks earlier than the wheat, and the Pentatomids on it then migrate and increase the infestation on the wheat. The experiment was accordingly carried out on ten plots of wheat alternating with ten of barley, which was being harvested. Five of the wheat plots were dusted with 0·8 per cent. parathion at about 31·5 lb. per acre without the use of a drag-sheet, and the others were left untreated. In each of two plots that were dusted in calm weather, about 89 per cent. reduction was obtained after 72–74 hours, but in the others the effectiveness of the treatment was appreciably reduced by wind. All of 1,406 adults and fourth-instar nymphs that were confined prior to treatment in a cage in one of the plots dusted in calm weather were dead within seven hours after treatment, whereas only two of some 239 caged in a control plot were dead in 24 hours.

It is concluded that 0·75–0·8 per cent. parathion applied in calm weather gives 70–80 per cent. reduction of the older, more resistant, stages at about 32 lb. per acre and is still more effective against the younger bugs. It is best applied when the majority of the population consists of second-instar nymphs.

SIGMONS (F. J.). Host Finding and Selection by *Spalangia drosophilae* Ashm.—*Bull. ent. Res.* **45** pt. 3 pp. 527–537, 1 fig., 11 refs. London, 1954.

In this account of further investigations on the biology of *Spalangia drosophilae* Ashm. (*cf. R.A.E.*, A **42** 43), a description is given of experiments to determine how the ovipositing females are attracted to an environment where suitable hosts may be found and the criteria by which these hosts are selected. Adults were exposed in a glass tube, 24 ins. long,

to various possible attractants in vials at one or both ends of the tube. The attractants included adults of the other sex, dry puparia of *Musca domestica* L., rearing medium containing larvae of *Drosophila [melanogaster Mg.]*, *Drosophila* puparia bearing remnants of dried medium, dry, empty, parasitised *Drosophila* puparia, wheat leaves, water, and dry, sandy loam alone or mixed with humus. The results indicated that ovipositing females tend to be attracted to dampness, a mixture of sandy loam and humus, wheat leaves, and larvae and pupae of *Drosophila* with their rearing medium; they congregated about $\frac{1}{2}$ inch away from water, thus avoiding a completely saturated atmosphere. In the field, response to the stimuli of soil and dampness would bring them to the base of the vegetation where they are likely to find suitable host puparia among grasses. Further searching for hosts appears to be random until a possible one is found, when it is subjected to careful examination. From the results of experiments in which females were offered Dipterous puparia, Lepidopterous pupae, and cocoons of Hymenopterous parasites and oviposited only in the first, it was concluded that the primary requisite was the presence of a small pupa within, but separated from, a chitinous case. When puparia containing normal pupae were also present, the females rejected puparia in which the pupae were already parasitised, had been punctured but not parasitised by another female, or had been killed by immersion in water at 120°F. for one minute, when they had the appearance of parasitised pupae, though in the last case there was preliminary examination by the antennae. It therefore appears that, in general, only hosts suitable for the development of the progeny are selected.

DAVEY (P. M.). Quantities of Food eaten by the Desert Locust, *Schistocerca gregaria* (Forsk.), in Relation to Growth.—*Bull. ent. Res.* **45** pt. 3 pp. 539–551, 7 graphs, 14 refs. London, 1954.

The following is almost entirely the author's summary. The weight of fresh grass eaten by *Schistocerca gregaria* (Forsk.) on each day of its development from hatching until maturation of the adults was investigated in the laboratory. The locusts used were the progeny of crowded females, and the grasses provided were mainly *Poa* spp., *Phleum pratense* and *Agropyrum repens*. Hoppers consumed on the average about 1 gm. per gm. body-weight per day on the middle days of each instar, and the adults approximately 0.5 gm. per gm. body-weight each day. The percentage of food assimilated, calculated from the dry excreta and estimated dry weight of food eaten, fell from about 78 in the first to 35 in the fifth instar. There were some indications that the food consumption per hopper increased with the number of hoppers per cage.

The weight of wheat bran eaten by the hoppers was also investigated. The amount eaten on the middle day of the first instar was about the same, in relation to body-weight, as that eaten per day just before and just after moulting by hoppers in the fourth and fifth instars. More was eaten in the middle of these instars.

Measurements of weights and lengths of males and females in the various instars and of the weights of adults showed that in the course of their development females became progressively heavier and larger than males. The weight of a newly hatched hopper was about 10 mg.; a female fledgling weighed about 2 gm., and a male 1.5 gm. Hoppers were about 1 cm. long on hatching, and males and females on reaching maturity were about 4.5 and 5 cm. long, respectively. The weight of wheat bran eaten during two-hourly periods by hoppers in the first, fourth and fifth instars indicated

that a daily average of 24 per cent. of a population of mixed age would eat less than 10 mg. per gm. body-weight and thus might not consume a median lethal dose of γ BHC if this was mixed with the bran at the standard concentration of 0·06 per cent.

POLLARD (D. G.). **The Melon Stem-borer, *Apomecyna binubila* Pascoe (Coleoptera: Lamiinae) in the Sudan.**—*Bull. ent. Res.* **45** pt. 3 pp. 553–561, 15 figs., 11 refs. London, 1954.

Apomecyna binubila Pasc., which is widely distributed in the Ethiopian and Oriental regions, and also occurs in Queensland and Chile, is a pest of cucurbits in South Africa [cf. *R.A.E.*, A **3** 60] and the Sudan. In the latter country, where sweet melons (*Cucumis melo*) and water melons (*Cucurbita citrullus*) are sometimes severely damaged by this Lamiid, its known distribution extends from 12 to 20°N. lat. All stages are described, and an account is given of laboratory investigations on its bionomics. The eggs were deposited singly under the rind of older melon stems and in the central hollow of young ones, mainly in the internodes, sometimes in the nodes, and occasionally in the petioles; infestation was greatest near the base of the stem. The egg stage lasted up to four days, and the larval and pupal stages averaged 25 and 5·9 days, respectively, at an average temperature of 87°F. The larvae mine in the stems, usually between the rind and the wood, and the average length of the gallery of a full-fed larva was about 2–3 ins. Up to 14 larvae and pupae were found in one piece of stem four inches long and rather less than an inch in diameter. Pupation occurred near the centre of the larval tunnel, and the newly emerged adults remained in the stem for up to 4–5 days. Near Wad Medani, where melons are grown continuously in riverain cultivations, all stages were present throughout the year. Adults were earlier recorded once on vegetable marrow (*Cucurbita pepo*), which, however, they did not attack, and twice on *Acacia arabica*; they did not feed on the flowers or leaves of the latter in the laboratory.

Oviposition and feeding on the leaves by the adults cause little damage, and larval feeding, as a result of which the stem splits, cracks and becomes discoloured, is not of importance unless populations exceed five per four-inch length of stem, when the vascular bundles become interrupted and the leaves die. Damage to young plants, in which the larvae feed mainly on the inner cortex and tend to be less numerous, is less severe, though the stems may split. When plants with low populations die, the roots have usually been attacked by larvae of *Aulacophora (Rhaphidopalpa) foveicollis* (Lucas), which destroy the vascular bundles and other root tissues. Larvae of *Apomecyna binubila* were occasionally found in the tap root, but only on plants in fine, sandy river silt. The larvae were parasitised by *Iphiaulax* sp., but only six cocoons of this Braconid were found in plant material that yielded 251 adults, larvae and pupae of the Lamiid.

WOODROFFE (G. E.) & SOUTHGATE (B. J.). **An Investigation of the Distribution and Field Habits of the Varied Carpet Beetle, *Anthrenus verbasci* (L.) (Col., Dermestidae) in Britain, with comparative Notes on *A. fuscus* Ol. and *A. museorum* (L.).**—*Bull. ent. Res.* **45** pt. 3 pp. 575–583, 3 pls., 5 refs. London, 1954.

The following is based partly on the authors' summary. The distribution and field habits of *Anthrenus verbasci* (L.), *A. fuscus* (Ol.) and *A. museorum*

(L.) in England were studied. Collections of adults from flowers, mainly those of *Heracleum sphondylium*, in 1951–52 showed that *A. verbasci* is abundant only in suburban areas of south-eastern England, but extends to the west along the south coast; that *A. fuscus* is generally distributed in the south, especially about farms, and diminishes rapidly in numbers towards the north; and that *A. museorum* occurs only in small numbers and often accompanies *A. fuscus*. Data obtained from collections of larvae confirmed these findings and indicated that *A. verbasci* and *A. fuscus* show sharply defined habitat differences, the former occurring characteristically in dry birds' nests [cf. R.A.E., A 42 43] and the latter being common in the nests of social insects, round spiders' webs in outhouses, where they feed on dead insects, in crevices in wood and under the bark of trees. *A. museorum*, which was not numerous, occurred in company with *A. fuscus*. A survey in buildings indicated that infestations by *A. verbasci* were sometimes heavy, when they were usually associated with the presence of birds' nests in the attics, and sometimes diffuse, involving much smaller numbers of larvae, when nests were absent. In both types, the attic appeared to be the chief source of larvae, and infestation of lagging on water-pipes was often conspicuous. Diffuse infestations were probably due to the presence of flowers attractive to the adults, which entered neighbouring houses and oviposited behind skirting boards and in similar situations.

Damage was caused mainly by larvae that migrated from the attics in September–October, when they were mostly fully grown. The most usual route appeared to be down water-pipes that passed from the attic tank to the airing cupboard or by way of the trap-door opening into the attic. Larvae that developed in places other than the attic also migrated at about the same time. Migrating larvae spread round a house largely by means of cavity walls, air bricks, skirting boards, picture rails, and floor cracks and on clothing transferred from the airing cupboard. They frequently damaged new or clean clothing, though not extensively. Damage to woollen goods in small commercial premises sometimes occurred, as a result of infestations of the diffuse type. In one instance, electrical faults in a telephone exchange were due partly to damage caused by larvae of *A. verbasci* to the wool-cotton insulation of certain wires.

The factors responsible for the recent increase and present distribution of *A. verbasci* are discussed. The most likely appears to be a possible slight climatic change in south-eastern England and the spread of suburban areas, the increased use in house construction of cavity walls, hot-water systems and unseasoned wood, the careless application of inferior plaster, and the development of housing estates with high sparrow populations and waste land harbouring plants attractive to the adults, though the introduction or local development of a strain more closely adapted to suburban conditions may be responsible. There appears to have been no comparable increase in *A. fuscus* or *A. museorum*.

A. verbasci is now considered to be of greater importance than *Tineola bisselliella* (Humm.) in south-eastern England, and this is attributed to its habit of attacking new or clean materials, the ineffectiveness against it of ordinary measures of household hygiene, its resistance to the insecticides in common use, and the need for co-operative control in heavily infested areas.

SWIRSKI (E.). **Fruit Tree Aphids of Israel.**—Bull. ent. Res. 45 pt. 3 pp. 628–638, 8 graphs, 22 refs. London, 1954.

An account is given of observations in Israel on the bionomics of *Hyalopterus arundinis* (F.) (*pruni* (Geoffr.)) and *Anuraphis (Brachycaudus) amygdalina*

(Schout.), both of which infest almond and cause the leaves to curl, and *Aphanostigma piri* (Kholodk.), which attacks pear [cf. R.A.E., A 39 62]. *H. arundinis* was found to reproduce parthenogenetically on reed (*Phragmites communis*) throughout the year, the average number of Aphids per heavily infested plant being estimated at over 31,000. Infestation was higher on reeds in dry situations than on those in water or bogs. Populations reached a peak at the end of spring and a lesser one in autumn and were low during winter. Alates were observed throughout the year, except in February, were relatively most numerous in April, and reproduced on reed in tests. Migration to almond occurred in autumn and winter eggs were laid on that tree. The eggs hatched at the beginning of February in the Esdraelon valley and in the latter half of that month on the coastal plain. Parthenogenetic reproduction led to peak populations on almond in late April and early May, when alates were produced and migrated to reed; small colonies of apterae remained on almond, but died out during summer. Apricot is similarly infested in autumn, but development of the spring population occurs only when the buds open early enough to provide food for the fundatrices. A heavy infestation was observed on peach in one locality in May 1951.

Anuraphis amygdalina was found to reproduce parthenogenetically on *Polygonum equisetiforme* throughout the year. Gynoparae and males were produced in autumn, and these migrated to almond in November, giving rise to oviparae that oviposited in crevices in the bark and in bud axils; in 1950, the first eggs were laid at the beginning of January. The sexual forms disappeared at about this time, owing to wet, cold weather in December and January, but persisted until the end of January in 1951, following warm, dry weather in these two months. The winter eggs hatched in mid-February in 1950 and a fortnight earlier in 1951, and maximum populations were reached at the end of April and the end of March in the two years, respectively. Alates appeared in April and May and migrated to *P. equisetiforme*, and almond was free from infestation by early June.

Aphanostigma piri bred parthenogenetically in the buds and in cracks in the bark of pear throughout the year, and no sexual forms were found. Infestation of the bark leads to cracking. The buds are attacked as they begin to open and many are destroyed, the injury being particularly serious on one variety that produces fruit buds in summer and sometimes flowers in October.

Brief notes are given on other Aphids that attack fruit trees in Israel. These include *Myzus persicae* (Sulz.), which infests *Citrus*, quince, pear, apple, almond, apricot, myrobalan [*Prunus cerasifera*] and Japanese plum [*P. salicina*] and reproduces parthenogenetically throughout the year on wild plants, vegetables and ornamentals. It is stated that a sexual generation occurs on apple and that the existing population on that tree in spring is reinforced by alate viviparous females that migrate to it. Apple is abandoned in May, and remains free of the Aphid until late autumn. Pear, plum, apricot and almond are invaded by viviparae in spring.

Among the natural enemies recorded, several Coccinellids prey on *H. arundinis* and *Anuraphis amygdalina* in spring, and *Coccinella septempunctata* L. on *Aphanostigma piri* in autumn. Larvae of a Cecidomyiid of the genus *Phaenobremia* attack the first two on almond in spring, but do not become numerous until the migrants have left. Syrphid larvae, among which *Lasiophthicus seleniticus* (Mg.) was prevalent, occurred in small numbers among *H. arundinis* on reed throughout the year and in large numbers with this Aphid and *Anuraphis amygdalina* on almond from March onwards. It is concluded that parasites and predators exert some control, but are not decisive in bringing about critical reductions in population.

MAQSUD NASIR (M.). **Responses of Pests to Fumigation. V. The Toxicity of the free and sorbed Vapours of BHC and DDT to some Insects infesting Stored Products.**—*Bull. ent. Res.* **45** pt. 3 pp. 639–646, 8 refs. London, 1954.

The following is largely the author's summary of this part of a series [cf. *R.A.E.*, A **42** 39, etc.]. The laboratory studies described were carried out to investigate the toxicity to insects of the vapours of p,p'DDT, commercial DDT and γ BHC both directly and when sorbed on stored products. After storage for six months in atmospheres saturated with the vapours, wheat retained sufficient of all three insecticides to control adults of *Calandra granaria* (L.) and inhibit the development of larvae of *Sitotroga cerealella* (Ol.). This control and inhibition were complete for BHC and more pronounced for commercial than for p,p'DDT. Similar results were obtained when the insecticides sorbed on flour were tested against the eggs or larvae of *Tribolium confusum* Duv. and when fumigated groundnut kernels were tested against the adults, but the groundnut kernels had little toxic action on adults of *Oryzaephilus surinamensis* (L.).

The commercial DDT had a rapid direct fumigant action on adults of *C. granaria* and *S. cerealella*, and since this toxicity was not shown by p,p'DDT, there seems likely to be a toxic volatile impurity, possibly p-dichlorobenzene, in commercial samples. This supposition was supported by the fact that commercial DDT subjected to prolonged aspiration did not have a pronounced fumigant effect. BHC had a greater fumigant action than commercial DDT on both *C. granaria* and *S. cerealella*, and differed from it in showing toxicity to the eggs of *S. cerealella*; eggs of *T. confusum* were not affected by any of the fumigants.

NEWTON (W.). **Transmission of Tobacco Mosaic by Citrus Mealybug.**—*FAO Plant Prot. Bull.* **2** no. 3 p. 40, 1 ref. Rome, 1953.

An early report of the transmission of tobacco mosaic by *Planococcus citri* (Risso) [*R.A.E.*, A **14** 62] was confirmed in Ceylon, where a tobacco plant infected with this disease and with Storey's leaf curl became accidentally infested by the mealybug. It was thought that the leaf curl might be transmitted by *P. citri*, but when adults that had fed on the infected plant for seven days were transferred to healthy tobacco seedlings in batches of four, all the plants developed typical symptoms of mosaic and none showed leaf curl. Mealybugs that had fed on these seedlings subsequently transmitted mosaic to other healthy tobacco seedlings. When mealybugs that had fed for seven days on the original infected plant were transferred in batches to single leaves on plants of *Nicotiana glutinosa*, 1–3 local lesions developed after three days at the feeding points on the leaves of plants that received ten mealybugs per leaf.

Outbreaks and new Records.—*FAO Plant Prot. Bull.* **2** no. 3 pp. 43–45, 1 ref. Rome, 1953.

C. G. MacNay reports (pp. 43–44) the finding in Canada for the first time in 1952 of several pests already known from North America. They include *Fasates lycopersici* (Massee) (*destructor* (Keifer)) on tomato in a greenhouse in Ontario; *Lygus nigrosignatus* Knight on cultivated mustard in Alberta; *Irbisia arcuata* Van D. on *Agropyrum intermedium* at the

Experimental Station, Lethbridge, Alberta; *Tomostethus multicinctus* (Rowe), on three ash trees in Ontario; *Cinara murrayanae* (Gill. & Palm.) on larchpole pine (*Pinus contorta* var. *latifolia*), in Alberta and Saskatchewan; *C. juniperi* Deg. on *Juniperus communis* in Ontario; *Apion longirostre* Ol. on *Trollius* [*Althaea*] in Ontario; *Aphomia galatiae* (Zell.) in a warehouse in Vancouver, British Columbia; and *Oryzaephilus surinamensis* var. *mercator* Fair., infesting insect specimens in Ontario. *Cynaeus angustus* (Lee.), which was recorded infesting grain at a place in Saskatchewan in 1944, was abundant on cereal products in a mill in Alberta in 1952.

W. J. Hall reports (p. 44) that *Ischyrodes aegyptiacus* (Dgl.) was noted for the first time in the Gilkes Islands in 1953, when it severely infested breadfruit [*Artocarpus communis*] and other plants on two islands, and was later found on a third. A colony of *Rodolia cardinalis* (Muls.) from Fiji was liberated on one island in an attempt to secure control.

The U.S. Bureau of Entomology and Plant Quarantine records (p. 45) that *Trogoderma granarium* Everts was recently found infesting wheat and, less severely, barley in store in Tulare County, California. It has probably been present in the State since 1946.

MCKNIGHT (T.). The Woodiness Virus of the Passion Vine (*Passiflora edulis* Sims).—*Qd J. agric. Sci.* **10** no. 1 pp. 4–35, 19 figs., 10 refs. Brisbane, 1953.

The virus disease known as woodiness [cf. R.A.E., A **27** 448; **36** 365] has been mainly responsible for the restriction of cultivation of passion vines (*Passiflora edulis*) in south-eastern Queensland. Infected plantations are commonly abandoned after a year or two, when they cease to be productive as a result of disease, and new ones established close by, often while the old ones are still standing. Surveys in new plantations showed that these most readily became infected when situated close to old ones and that initial infections were most numerous in the sections nearest to the old infected vines. Studies in the greenhouse and field indicated that symptoms of 13 types, which are described, are associated with the disease and that there is a seasonal variation in their expression. They include the typical foliage mottle, in which the leaves are puckered in appearance and which is most marked during winter and spring, and fern leaf, in which the lobes of the leaves become filiform and which appears during spring and early summer and is sometimes associated with a yellow spot mottle, but not with the typical foliage mottle.

Regular surveys in four plantations and other observations confirmed earlier findings that the insect fauna of passion vines is not large [cf. **27** 448]. *Myzus persicae* (Sulz.), *Macroziphum solanifolii* (Ashm.) (gei, auct.) and *Aphis gozzypii* Glov., which have been shown to be vectors of the virus, were all present on occasion, but appear to breed only rarely on the vines. The insects most commonly present were thrips, which reached peak populations during August–November; *Thrips tabaci* Lind. and *T. imaginis* Bagn. were the commonest. The virus has been thought to be the same as Cucumber virus I [cf. **36** 365], but attempts to transmit it to cucumber, tomato, tobacco, *Datura stramonium* and *Lupinus mutabilis* by means of leaf grafts were unsuccessful. In tests with commonly occurring wild species of *Passiflora*, it was transmitted successfully to *P. foetida*, and *P. alata*, but not to *P. suberosa*, and transmission was effected from diseased to healthy *P. edulis* on scutellars; some evidence was obtained in these last tests that the fern-leaf and typical foliage-mottle symptoms are caused by distinct strains of the virus.

GIVEN (B. B.). A Revision of the Melolonthinae of New Zealand. Part I: The Adult Beetles. HOY (J. M.) & GIVEN (B. B.). **Part II: Final Instar Larvae.** —*Bull. N.Z. Dep. sci. indust. Res.* no. 102, 172 pp., 29 pls. (4 col.), 29 refs. [Wellington, N.Z.] 1952. Price 12s.

The only change in this revision affecting species that have been recorded as of economic importance in New Zealand [*cf. R.A.E.*, A 40 205] is that *Costelytra*, gen. n., is erected for *Odontria zealandica* (White); it also includes *O. brunnea* (Broun) and four new species.

GIVEN (B. B.). General Report on a Search for Parasites of Melolonthinae in Australia. —*N.Z. J. Sci. Tech.* 34 (B) no. 5 pp. 322–340, 6 figs., 2 refs. Wellington, N.Z., 1953.

Since previous attempts to introduce parasites into New Zealand for the control of *Costelytra* (*Odontria*) *zealandica* (White) had been unsuccessful [*cf. R.A.E.*, A 32 164], surveys to discover species that might be of value were made in Australia during 1945–51, mostly in south-western Victoria, where there was believed to be a fairly extensive parasite fauna on Melolonthids related to *C. zealandica* and where climatic, soil and pasture conditions closely resemble those in parts of New Zealand. Attention was concentrated on Thynnids, which appeared the most promising, and adults of over a hundred species were collected in various ways. Of these, 13 species were sent to New Zealand for further investigation, and very brief notes are given on their hosts, feeding habits, flight period and abundance in Australia, as well as general information on the biencies of Thynnids. In all, 93 consignments of Thynnid adults comprising 14,117 pairs were dispatched and, in addition, there were two consignments composed wholly and two partly of Thynnid cocoons, one of Tachinids and two that included Scoliids, but these did not arrive in numbers or condition suitable for further work. The adult Thynnids were at first dispatched in tubes provided with honey solution and containing a length of string as support for the insects; in 1951, however, containers that accommodated 30–40 pairs each were used and gave excellent results. They were about 4 ins. in both diameter and height, were lined with blotting paper soaked in honey solution, and loosely filled with wood wool, and had a gauze panel in the lid and a $\frac{1}{2}$ -inch hole, subsequently corked, in the bottom, through which the insects were admitted. Total mortality amounted to 21 per cent. in the 13 species, but to only about 12 per cent. in those eventually found of possible value.

In all, 10,730 pairs representing 11 species were liberated during 1948–51 in six areas in North Island and three in South Island. Most belonged to five species that had been shown in laboratory trials during 1947–49 to parasitise larvae of *C. zealandica* and that were active in spring or to one from New South Wales that was active in late summer and was introduced for use in cool districts. At the time of writing, a spring species tentatively identified as *Thynnoides gracilis* (Westw.) had become established on *O. smithii* Broun or *O. striata* White at one place in South Island [*cf. 40 205*]; its flight period is too late for it to attack *C. zealandica*.

LAMB (K. P.). Observations on Yield and varietal Susceptibility of some Carrot Varieties to Insect Attack in the Field. —*N.Z. J. Sci. Tech.* 34 (A) no. 6 pp. 531–537. Wellington, N.Z., 1953.

The following is based on the author's summary. The results are given and discussed of three field trials carried out in New Zealand in 1950 and 1952 to compare six varieties of carrots with respect to yield, mean plant weight and infestation and damage by the Aphid, *Caratiella acropodii* (Scop.).

and the rust fly, *Psila rosae* (F.). The variety that gave the highest yield and was least damaged by the Aphid was the most heavily infested by *P. rosae*. The variety least infested by *P. rosae* supported the greatest numbers of the Aphid and was the most damaged by it. The other four varieties were moderately damaged by the Aphid and at maturity were moderately infested by *P. rosae*; one that was more vigorous than the other three also gave rather higher yields.

Aphid densities per whole plant and the numbers of Aphids per single leaf were significantly lower on the variety that gave the highest yield and was least damaged by the Aphid. This may indicate some degree of resistance, but it is possible that the resistance is due, at least in part, to the greater vigour of this variety.

PALMER (T. P.). Resistance of Swedes to Aphids. I. Resistant Varieties.
—*N.Z. J. Sci. Tech.* 34 (A) no. 6 pp. 553–555. Wellington, N.Z., 1953.

The resistance to *Brevicoryne brassicae* (L.) of 45 varieties and lines of swedes was investigated in New Zealand in 1952 by assessing visual damage to the foliage in experimental plots exposed to heavy infestation. Six showed little damage, in addition to two already known to be resistant.

LAMB (K. P.). Survey of Red Spider Mites (Acarina: Tetranychidae) on Grape Vines.—*N.Z. J. Sci. Tech.* 35 (A) no. 1 pp. 65–66. Wellington, N.Z., 1953.

A survey of the red spider mites that damage grape vines in glasshouses in New Zealand was begun in 1950 in order to discover the identity of the species present. Those found were *Tetranychus telarius* (L.) (*urticae* Koch), which was widespread, and *T. (Eotetranychus) sexmaculatus* Ril., which was confined to the Auckland district in the North Island. Field characters for the recognition of the eggs and adults of the two species are given.

TUNBLAD (B.). Ytterligare erfarenheter om spinnmedel. [Further Experience in Mite Control.]—*Växtskyddsnotiser* 1952 no. 5–6 pp. 82–84. Stockholm, 1952.

In tests against *Paratetranychus pilosus* (C. & F.) on apple in Sweden in 1952, in which the trees were sprayed on 30th June (about a month after flowering), the numbers of mites per leaf on 30th July averaged 0 for 0·03 per cent. Systox [diethyl 2-(ethylmercapto)ethyl thiophosphate], 0·7 for 0·25 per cent. of spray powders containing 20 or 50 per cent. Ovotran (p-chlorophenyl p-chlorobenzenesulphonate) or 0·2 per cent. of an emulsion concentrate containing 30 per cent. Ovotran, 2 for 0·25 per cent. of a spray powder containing 15 per cent. Aramite [2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite], 5·1 for 0·1 per cent. Pestox 3 [which contains schradan], 10·3 for 0·1 per cent. of an emulsion concentrate containing 15 per cent. parathion, 12·3 for 0·2 per cent. of an emulsion concentrate containing 15 per cent. Aramite, and 13·3 for 0·08 per cent. Isopestox [bis(monoisopropylamino) fluorophosphine oxide], whereas the number had risen from 8·3 on 6th July to 37·5 in the controls. The treatments with Pestox 3, parathion, the Aramite emulsion and Isopestox were repeated on 31st July, and the numbers on 25th August in the original order averaged 0·8, 16·4, 3·2, 2, 17·4, 8·5, 19·1, 2·3 and 0·1, respectively, as compared with over 50 in the controls.

BORG (Å.). **Harkrankshärjningarna 1952.** [The Outbreaks of Tipulids in 1952.]—*Växtskyddsnotiser* 1952 no. 5–6 pp. 85–92, 2 figs., 1 map. Stockholm, 1952.

An outbreak of Tipulids, the severest on record, occurred in western Sweden in 1952, following the development of large populations in the preceding two years. The species mainly concerned was *Tipula paludosa* Mg., and damage was caused by the overwintered larvae to pasture grasses, cereals, rape and several other crops. In experiments on control by means of poison baits, moistened mixtures of bran and various parathion preparations proved much more effective than similar mixtures of bran and paris green, and parathion emulsion sprays applied to the ground cover also gave high mortality. Directions are given for preparing suitable parathion baits and sprays.

MÜHLOW (J.). **Pyrenon—en ny typ av insektbekämpningsmedel.** [Pyrenone—a new Type of Insecticide.]—*Växtskyddsnotiser* 1953 no. 1 pp. 1–4. Stockholm, 1953.

WAHLIN (B.). **Pyrenonpreparaten och bina.** [Pyrenone Preparations and Bees.]—*T.c.* pp. 4–6.

The author of the first paper cites literature demonstrating the synergistic effect of the addition of piperonyl butoxide to pyrethrum in the proportion of 10:1 and states that commercial powders containing such mixtures showed considerable promise against insects attacking rape in preliminary tests in Sweden in 1951–52. When adults of *Ceuthorrhynchus assimilis* (Payk.) were confined with dusted shoots, over 90 per cent. of the weevils were usually found dead or dying in 20 hours, though there was some variation in effectiveness between the different products. Most of the powders retained their full toxicity after exposure of a thin layer in the open for two days and were only slightly less effective after three.

In the second paper, it is stated that the powders normally showed little toxicity to honey bees in the laboratory or when applied to flowering rape in the field, though there were again differences between products.

NOLTE (H. W.) & FRITZSCHE (R.). **Beobachtungen anlässlich des Massenauftrittens der Ypsilononeule (*Rhyacia* = *Agrotis ypsilon* Rott.) im Sommer 1952 in Mitteldeutschland.** [Observations concerning the Outbreak of *Agrotis ypsilon* in the Summer of 1952 in central Germany.]—*Anz. Schädlingesk.* 26 pt. 3 pp. 33–35, 6 figs., 6 refs. Berlin, 1953.

Agrotis (Rhyacia) ypsilon (Hfn.) is not normally a serious pest in Germany but caused considerable damage in the summer of 1952 to various crops, including *Gladiolus*, carrots, beet and potato, in several central districts. The injury is described and possible reasons for the outbreak are discussed. Many of the larvae were parasitised by *Amicroplus (Macrocentrus) collaris* (Spin.).

RÖNNEBECK (W.). **Über eine Besonderheit in der Entwicklung der Fundatrigenie von *Myzodes persicae* Sulzer im Jahre 1952 in NW-Deutschland.** [On a Peculiarity in the Development of the Fundatrigeniae of *Myzus persicæ* in 1952 in north-western Germany.]—*Anz. Schädlingesk.* 26 pt. 3 pp. 35–37, 2 figs., 5 refs. Berlin, 1953.

Although it has been shown in Germany that alates may occur in spring among the first generation of fundatrigeniae of *Myzus (Myzodes) persicæ*

(Sulz.) on peach, they are normally scarce and migrate only a few days before mass migration of the second generation [cf. R.A.E., A 41 341]. In 1952, it was observed in many areas in the Rhineland and Westphalia that first-generation migrants were produced in greater numbers and at an earlier date than usual, so that whereas the first fundatrices became adult on 10th April near Bonn, up to 20 per cent. of the population in various colonies consisted of third-instar alates by 21st April. This is attributed to the effect on the food-plant of unusually high temperatures between 9th and 19th April. The first migrants left the trees only 18 days after the first fundatrices became adult, as compared with 30–38 days in the three preceding years, and the interval between the departure of the first alates and mass migration was ten days. This was only three days more than the usual maximum, but the number of alates increased rapidly and, in contrast to the observations of previous years, migration from the trees continued without interruption and merged with that of the second generation.

BERAN (F.). Aufreten und Bekämpfung des Kartoffelkäfers in Österreich im Jahre 1953. [The Occurrence and Control of the Potato Beetle in Austria in 1953.]—*Pflanzenschutzberichte* 12 pt. 1–2 pp. 25–34, 1 map. Vienna, 1954. (With a Summary in English.)

In 1953, *Leptinotarsa decemlineata* (Say) was taken on potato over greater areas in each of the provinces of Austria than in 1952 [cf. R.A.E., A 42 65], except Upper Austria and Styria, and the number of communes infested increased in all but Upper Austria. The beetle was successfully controlled by spraying, mainly with DDT (Gesarol) or calcium arsenate, and an excellent crop was obtained.

WENZL (H.) & SCHREIER (O.). Spinnmilbenschäden (*Tetranychus althaeae* v. Hanst.) an Zuckerrübe. [Damage to Sugar-beet by Red Spider Mites (*T. telarius*).]—*Anz. Schädlingsk.* 26 pt. 4 pp. 49–51, 2 figs., 18 refs. Berlin, 1953.

Injury to the leaves of sugar-beet was caused by *Tetranychus telarius* (L.) (*althaeae* (v. Hanst.)) in parts of Lower Austria in August–September 1952. Infestation was heavy on poor soil and resulted in symptoms resembling those caused on the leaves of fruit trees, but where it was less intense, the upper surfaces of the leaves showed yellow patches above the sites of infestation on the lower surfaces somewhat similar to those caused by virus yellows, and characters by which mite attack can be distinguished from infection with yellows are given.

SEDLAG (U.). Wurzelläuse an Futter- und Zuckerrüben. [Root Aphids on Fodder- and Sugar-beet.]—*Anz. Schädlingsk.* 26 pt. 4 pp. 51–52, 3 figs., 7 refs. Berlin, 1953.

Fodder-beet harvested in September 1952 at an experimental station in central Germany was found to be infested by root Aphids, believed to be *Pemphigus fuscicornis* (Koch). Infestation was restricted to a small area, in which it was estimated on the basis of a sample count that there were at least 5,000 examples per beet. All the roots and the beet itself were infested, and the root system was covered with waxy threads secreted by the Aphids. All stages were present at the end of September, but though a high proportion of the nymphs had wing-pads, few winged adults were

found. Alates kept on beet in pots left the soil without reproducing, whereas apterae persisted under the same conditions and also infested pieces of beet in petri dishes. Sugar-beet harvested at the end of October was heavily infested, but few young nymphs and no alates were then present.

Development on beet in pots was normal in early October, but of 23 pots to which the Aphids were added at the end of that month, only two contained normal colonies in mid-November, three contained small colonies, and the majority of the remainder were free from infestation, presumably as a result of migration to a winter food-plant. It is concluded that anholocyclic development is probably of little importance, though considerable numbers of Aphids were found in a beet clamp opened at the end of the following January. The beet in the infested field was heavily infected with virus yellows, but Aphids collected from it did not transmit the disease to any of 13 healthy beet plants to which they were transferred, though one of the plants developed mosaic.

THALENHORST (W.). Vorzeitiger Zusammenbruch einer Massenvermehrung von *Gilpinia frutetorum* F. (Hym., Diprionidae). [The premature Collapse of an Outbreak of *G. frutetorum*.]—*Anz. Schädlingsk.* **26** pt. 4 pp. 53–56, 2 figs., 8 refs. Berlin, 1953.

Following the outbreaks of *Gilpinia frutetorum* (F.) on pine in northern Germany in 1948–49 [*R.A.E.*, A **41** 250], heavy infestation was again reported between Bremen and Osnabrück in the winter of 1951–52, when investigations indicated that the number of cocoons in the litter ranged up to about 250 per sq. yard. When the cocoons were first examined, at the end of March 1952, 91 per cent. of the insects were still in the conymphal stage, 8 per cent. were parasitised in equal proportions by Ichneumonids and Chalcidoids, and the remainder were infested by fungi; the average dimensions of the cocoons were almost the same as in 1949, but the ratio of males to females had increased to 7:3 [*cf. loc. cit.*]. It was presumed from the low level of parasitism that the outbreak had not yet passed its peak. The principal parasite reared was the Ichneumonid, *Aptesis (Microcryptus) basizona* (Grav.); *Dahlbominus fuscipennis* (Zett.) was absent and was replaced by the Pteromalid, *Tritneptis klugii* (Ratz.). Adults of both parasites emerged early in the laboratory, and those of the first were able to produce a further generation in the cocoons of the sawfly. When these were again examined at the end of June, 35 per cent. had given rise to adults or were ready to do so, 11 per cent. still contained conympths, 13 per cent. were parasitised by Ichneumonids and 3 per cent. by Chalcidoids, 35 per cent. had been attacked by predators, and 3 per cent. had been destroyed by fungi, desiccation or other factors. A high rate of oviposition was forecast, but examination of the trees on 26th July revealed no eggs, though many males and females were present. Field-collected females were enclosed on pine twigs, and when these were inspected ten days later it was found that oviposition and hatching had been largely prevented by a heavy flow of resin, which had sealed the oviposition slits and concealed most of the eggs that were present. Few eggs were parasitised.

It is concluded that excessive multiplication of *G. frutetorum* may normally be prevented by the flow of resin, especially as the Diprionines that are most frequently injurious deposit their eggs in rows in the needles and not singly, as *G. frutetorum*. A multiple injury is likely to provoke a less intense flow at any particular spot. Drought is said to restrict resin production, and examination of meteorological records for three localities in which outbreaks of *G. frutetorum* have occurred since 1929 showed that they usually followed periods of drought and high temperature.

BOSELLI (F.). Risultati degli esperimenti di lotta contro la *Ceratitis capitata* Wied. in Sardegna, nel 1952. [Results of Experiments on the Control of *C. capitata* in Sardinia in 1952.]—*Ann. Sper. agr.* (N.S.) 8 no. 1 pp. 239–270, 1 ref. Rome, 1954. (With a Summary in English.)

Further experiments were made in 1952 on the control of *Ceratitis capitata* (Wied.) on peach in Sardinia [cf. *R.A.E.*, A 41 397]. The population of this fruit-fly has greatly increased in recent years, and the extension of peach-growing in association with *Citrus* has favoured the development of 2–3 or even four generations between June and October. Up to 50 per cent. of the peaches ripening in June were lost in 1952, and the entire crop of those ripening in August–September is destroyed in some years. The first of the two orchards in which the experiments were carried out contained mixed varieties ripening in June, July and the first three weeks of August. Sprays were applied six times, at intervals of about 8–10 days, between 19th–20th June and 4th–8th August, 5 per cent. sugar being added in the first two applications. The percentages of fruits punctured on varieties ripening in July and in August were 1·5 and 2·6, respectively, for six applications of 0·5 per cent. wettable DDT, 1·2 and 13 for four of 0·015 per cent. wettable parathion followed by two of 0·3 per cent. DDT in an emulsion spray, 1 and 4·2 for four of 0·02 per cent. parathion followed by two of 0·3 per cent. DDT, both in emulsion sprays, and 0·8 and 1·8 for four of a mixture of 0·8 per cent. DDT and 0·02 per cent. parathion, followed by two of 0·3 per cent. DDT. Parathion was not applied after the beginning of August, at least ten days before picking, to avoid toxic residues on the fruits. The second orchard contained mainly varieties ripening in the first three weeks of August and an emulsion spray containing 0·3 per cent. DDT was applied 12 times between 11th June and 13th August. The percentages of fruits punctured were about 6, 7 and 12 in June, July and August, respectively, during which months the numbers of applications were 2, 6 and 4. The percentage punctured on control trees rose from 8·2 to 55·7 between 8th and 28th June. The cost of the various treatments is discussed, and it is shown that the spray of 0·02 per cent. parathion, which was the most effective, was also the cheapest.

From mid-July, trees that had been sprayed with parathion or DDT were severely infested by *Tetranychus* sp., which migrated from beans, and an application of 1 per cent. mineral oil was required for control. The affected trees lost their leaves at least a month earlier than usual.

LEONARDI (C.). Esperimenti di lotta contro la *Ceratitis capitata* Wied. su looto e agrumi con prodotti organici di sintesi. [Experiments on the Control of *C. capitata* on Persimmon and *Citrus* with synthetic organic Products.]—*Ann. Sper. agr.* (N.S.) 8 no. 1 pp. 271–282, 4 graphs. Rome, 1954. (With a Summary in English.)

Experiments were carried out in 1952 on the control of *Ceratitis capitata* (Wied.) on persimmon and *Citrus* near Salerno, Italy. Bait-traps containing 5 per cent. diammonium phosphate were placed in the persimmon trees from early September, and the numbers of adults taken reached their peak about the last week of that month. Treatments were applied to two plantings on 8th–9th and 28th–29th September and 18th–19th October. The percentage of fruits infested in the first group on 22nd–23rd October was reduced from 54·6 for no treatment to 25·9 by 0·45 per cent. DDT in an emulsion spray, 27·86 by 0·015 per cent. parathion in a wettable-powder spray, 33·66 by 0·02 per cent. parathion in a emulsion spray and 37·21 by a 2 per cent. parathion dust. The corresponding percentages in the second

group on 28th–29th October were 55.92 for no treatment, 16.01 for 0.5 per cent. DDT in a wettable-powder spray, 19.48 for a mixture of 1 per cent. white summer oil and 0.02 per cent. parathion, and 31.47 for an emulsion spray of 0.45 per cent. DDT and 0.02 per cent. parathion.

The tests on *Citrus* were carried out in a mixed planting of orange and mandarin orange. Bait-traps were placed in the trees on 10th October, maximum numbers of *C. capitata* were taken between 28th October and 5th November, and treatments were applied on 20th October and 8th and 28th November. The percentages of fruits infested on 2nd–3rd December, when picking began, and (in brackets) on 10th–11th December, when it was completed, were 39.6 (39.66) for no treatment, 10.14 (5.72) for 0.45 per cent. DDT in an emulsion spray, 9.63 (7.73) for 0.015 per cent. parathion in a wettable-powder spray, 18.94 (17.77) for 0.02 per cent. parathion in an emulsion spray, 20.5 (20.5) for a 2 per cent. parathion dust, 7.4 (6.64) for 0.5 per cent. DDT in a wettable powder, 6.01 (5.3) for a mixture of 1 per cent. white summer oil and 0.02 per cent. parathion, and 9.67 (4.34) for a mixture of 0.45 per cent. DDT and 0.02 per cent. parathion.

DOMENICHINI (G.). Parassiti e iperparassiti di *Pseudococcus citri* Risso in Italia e nel Perù. [Parasites and Hyperparasites of *Planococcus citri* in Italy and Peru.]—*Boll. Zool. agr. Bachic.* **17** fasc. 3 pp. 157–180, 10 figs., 5 refs. Turin, 1951. (With Summaries in German and English.)

It is stated in the first part of this paper that the primary parasites of *Planococcus* (*Pseudococcus*) *citri* (Risso) known with certainty to occur in Italy are *Leptomastides abnormis* (Gir.) and *Anagyrus pseudococci* (Gir.). The first of these Encyrtids was not found by the author in investigations in various districts of Lombardy, but the second, the immature stages of which are described, was observed in 1950–51 parasitising the mealybug on grape vines near Lake Garda, where it afforded valuable control. The adults paired 4–5 days after emergence, and the females oviposited in the abdomen of the female nymphs or adults of *P. citri*. The larvae fed in their hosts, completely destroying them in eight days, and pupated in the hardened skins 2–3 days later. The pupal stage lasted 5–6 days, and complete development 18 days in summer. Winter was passed as larvae, which became full-fed in April, and gave rise to adults in May, and the last females oviposited in October, so that there may be 6–8 generations a year. *A. pseudococci* was itself parasitised by *Thysanus elongatus* (Gir.), the adults of which are described and which had previously been recorded only from the United States. Adults of this Signiphorid emerged in May or later, and the females oviposited on the full-fed larvae and pupae of *A. pseudococci* within their dead hosts. They were reported by Timberlake & Clausen in California [*R.A.E.*, A **12** 588] to lay five eggs in a single host in 82 minutes, but in the author's experiments they laid only one per host, in 6–10 minutes. The eggs hatched in 3–5 days in late May, and the larval and pupal stages lasted about three weeks and ten days, respectively. Feeding was normally external on *A. pseudococci*, but the larvae occasionally entered their hosts after a period of external feeding and fed internally. This occurred only when the hosts were in the late pupal stage or already adults, and in this case the larvae also pupated within their hosts. *A. pseudococci* was also parasitised by *Pachyneuron coccorum* (L.). Larvae of this Pteromalid overwintered, pupated in April and gave rise to adults in late April or early May, and females oviposited on the larvae or pupae of *A. pseudococci*, laying one egg per host. The egg and larval stages lasted

3–5 and about ten days, respectively. *P. coccorum* was occasionally parasitised by *T. elongatus*, and the percentage of parasitised examples of *Plano-coccus citri* from which the latter emerged was four in May 1950, considerably higher in September and 23 in the spring of 1951.

The second part consists of descriptions of the females of three Encyrtids that emerged with other Chalcidoidea from examples of *P. citri* and *Pseudococcus maritimus* (Ehrh.) collected in the Carabayllo Valley of Peru. They are *Aenasius masii*, sp. n., and *Grandoriella lamasi*, gen. et sp. n., which were primary parasites of the two mealybugs, and *Achrysonophagus* sp., which was probably parasitic on the primary parasites.

BALCELLS R. (E.). *Estudio biológico de Haltica lythri subespecie ampelophaga, Guérin-Méneville (Col. Halticinae).* [A Study of the Bionomics of *H. lythri ampelophaga*.]—*Publ. Inst. Biol. apl.* **14** pp. 5–46, 8 pls. (2 col., 3 fldg.), 1 fldg. table, 35 refs. Barcelona, 1953. (With a Summary in English.)

A detailed account is given of field and laboratory observations near Barcelona, mainly in 1948, on the bionomics of *Haltica lythri ampelophaga* Guér., the adults and larvae of which are injurious to the leaves of grape vines in Spain [*cf. R.A.E.*, A **37** 68]. The adults overwinter in the soil at the base of the vines and were first observed in 1948 on 30th March in one locality and in mid-April in another. Adults of the three succeeding generations emerged at the beginning of July, in mid-August and in early October. Maximum numbers of larvae were present in the second half of August, but these did not affect the size of the crop as the grapes were harvested during the first ten days of August, though the feeding of the larvae sometimes caused the production of new shoots and flower buds in September. Details are given of rearing experiments with material collected in the field in the autumn of 1947 and kept in the laboratory, in which the temperature averaged 21.3°C. [70.34°F.] between March and November, as compared with an average of 19.5°C. [67.1°F.] in the field between April and November. Five overlapping generations were reared in the year, adult emergence beginning on 16th May, 26th June, 3rd August, 11th September and 20th November, respectively, and possible causes of the difference in the numbers of generations obtained in the field and in the laboratory are discussed; the most important appeared to be the influence of temperature on oviposition.

Adult mortality during the winter was apparently very high, and collection of the few adults present on the vines in spring, before they had oviposited, considerably reduced the population in the field in July–August.

VASSEUR (R.) & BIANCHI (H.). *Sur l'efficacité de produits insecticides divers utilisés contre les cochenilles diaspines des arbres fruitiers en traitements d'hiver.*—*Ann. Epiphyt.* **4** no. 1 pp. 45–58, 5 refs. Paris, 1953.

Quadrastichus perniciosus (Comst.), *Epidiaspis leperii* (Sign.) and *Pseudaulacaspis* (*Diaspis*) *pentagona* (Targ.) are serious pests of fruit trees in France, and various winter sprays were applied against them, especially the first, in experiments to determine the efficacy of recently developed materials and formulations and the specific value of established treatments against Diaspines. Mortality counts were made 6–8 weeks after application, and control percentages were calculated by Abbott's formula [*R.A.E.*, A **13** 331].

A first series of tests was made against *Q. perniciosus* on pear in February 1948, and the control percentages were 99·2 and 100 for a highly refined white oil emulsion (summer oil) of the mayonnaise type containing 83 per cent. actual oil at 2·5 and 3 per cent., respectively, 96·5, 100 and 100 for a product containing 67 per cent. oil and 2 per cent. DNC at 1, 2 and 3 per cent., lower, though not calculated, owing to high mortality on unsprayed trees, for one containing 60 per cent. oil and 7 per cent. dinitrochlorobenzeno at 1–2 per cent. and another containing 47 per cent. tar distillate (anthraeene oil), 7 per cent. DNC and 3 per cent. dinitrochloroeyclohexane at 2 per cent., and 41·7 for a mixture of 50 per cent. α -monechloromaphthalene and 8 per cent. BHC at 2 per cent. The temperature during and for several days after treatment averaged 5–11°C. [41–51·8°F.], and the relative humidity was 75–85 per cent. The sprays were prepared with rainwater, and the Coccoid was in a comparatively advanced stage of development. Conditions were thus exceptionally favourable for control, and under less advantageous conditions in 1949, sprays of DNC and oil did not prove sufficiently effective at less than 2 per cent. DNC without oil gave poor results.

E. leperii, which occurs together with *Q. perniciosus*, and *P. pentagona*, which infests mulberry, were much more resistant. In 1949, the control percentages given by sprays of 6 per cent. schist oil emulsion and 2 per cent. of a miscible oil containing 90 per cent. oil and 5 per cent. DNC were about 50 and 97–99·5, respectively, for *Q. perniciosus* and little more than 5 and 52–58 for *E. leperii*, and in 1948, the white oil at 3 per cent. and the spray of DNC and oil used in that year at 2 per cent. gave only 72·1 per cent. control of *P. pentagona*. Unlike *Q. perniciosus*, both these species overwinter as adults.

Various oils alone and in mixtures and with or without additional toxicants were tested against *Q. perniciosus* in 1950–51 with the object of defining the importance of each ingredient and of the physical nature of the product. The control percentages obtained were 91, 98·8 and 100 for 1, 2 and 3 per cent. of the highly refined white oil previously used, 98–100 and 100 for 2 and 3 per cent. of a less highly refined winter oil emulsion containing the same amount of actual oil, 99·7–100 and 100 for 3 and 5 per cent. of a mayonnaise emulsion containing 50 per cent. oil and 83 per cent. acetone, 70·4–94·5, 99–100 and 100 for 1, 2 and 3 per cent. of a miscible oil containing 71 per cent. actual oil and 2·5 per cent. DNC, 75·8–92·8, 92·8–97 and 89·8–96·8 for 2, 3 and 4 per cent. of a miscible oil containing 50 per cent. actual oil and 10 per cent. DNC, 60·4–84·7 and 96·7–97 for 3 and 4 per cent. of a mixture containing 42 per cent. tar distillate, 28 per cent. petroleum oil and 3·5 per cent. DNC, 74–85·6 for 3 per cent. of a mixture of 45 per cent. tar distillate and 10 per cent. DNC, 34·4–70·9 for 6 per cent. of a mixture containing 60 per cent. tar oil and 18 per cent. petroleum oil and 76·2, 96·3–97·8 and 94·5–98 for 0·25, 0·5 and 0·75 per cent. Tritane (86 per cent. dinoseb (triethanolamine)).

It is concluded that oil emulsions of the mayonnaise type are more effective than miscible oils of the same oil content, that the addition to them of DNC, but not of other dinitro compounds, is advantageous, that schist oils, tar oils and tar distillates are of little value against Diaspines, and that Tritane was ineffective, probably because of its poor adhesiveness.

DUFFY (E. A. J.). *Trinophyllum cribratum* Bates (Col., Cerambycidae). A new Indian Pest of British Timber Yards. Ent. Gaz. 4 pt. 4 pp. 254–264, 3 pls., 6 figs., 11 refs. Feltham, Mddx., 1953.

Trinophyllum cribratum Bates, which attacks oak logs in India, was discovered in England in July 1946, when adults emerged from logs of English

oak (*Quercus robur*) from Hertfordshire in store in the Isle of Wight. In the following year, adults again emerged, in larger numbers, and others developed in oak logs stored in a garden at Feltham, Middlesex. In 1953, adults attracted to light at Feltham were found to have originated in a local timber yard, where many hundreds of logs of oak and beech were infested. The oak had been sawn and stored in 1951 and had been attacked subsequently; the numbers of larvae that had not yet penetrated below the sapwood to pupate amounted to 1 per 2 sq. ins. In the beech logs, which had been felled just over a year before, the fully grown larvae had penetrated into the heartwood to a depth of 2 ins. and had caused depreciation in value of at least 20 per cent. The timber yard had been used over the preceding ten years for the temporary storage of timber from a London wharf, at which the logs in the Isle of Wight had also been stored, and examination of the timber there showed that much breeding had taken place in 1952 and that many thousands of oak logs were heavily infested. Attack was also widespread, though less severe, in beech and moderately heavy in larch and pine; evidence of earlier attack was found on walnut. Smaller infestations were discovered in oak, beech and hornbeam (*Carpinus*) in two timber yards in north London, and other timbers attacked were birch, ash and *Platanus*. The initial source of the infestation, which may now be widely distributed over the country and may even affect standing trees, is assumed to have been timber received at the wharf from India 10–20 years ago.

The paper includes descriptions of the adult, full-fed and first-instar larva, and egg, with characters distinguishing the first two from the corresponding stages of the native *Phymatodes testaceus* (L.), which also attacks oak and other timbers. The eggs are deposited singly in crevices in the bark of recently felled or seasoned wood; a field-collected female laid 44 eggs in captivity, and they hatched in six days. The larvae bore through the bark and feed in the outer sapwood to a depth of $\frac{1}{8}$ in., though if the bark is very thick, feeding is almost entirely confined to its inner wall. The galleries run mainly parallel with the grain and are tightly packed with frass. When fully grown, the larvae construct pupal cells that penetrate into the wood for 1½–2 ins. The adults emerge between mid-July and early September, with a peak usually at the end of July or in early August, and can fly at least $\frac{1}{4}$ mile. There appears to be one generation a year. To check the spread of this Cerambycid, the bark should be removed from all felled timber. In the case of fresh logs, treatment can safely be postponed for up to five months from the time of felling, since the larvae do not penetrate the wood until they are about six months old.

MASSEE (A. M.). **The Pests of Fruits and Hops.**—3rd edn., $8\frac{1}{2} \times 5\frac{1}{2}$ ins., xvi + 325 pp., col. frontis., 32 pls., many refs. London, Crosby Lockwood & Son, Ltd., 1954. Price £1 5s.

This third edition of a manual on the pests of fruit and nut trees, bush fruits, strawberries and hops in Britain resembles the previous one [*R.A.E.*, A 34 101] in the scope and arrangement of its subject matter, but the information, especially that on control, has been revised, several additional pests are included, and the chapters on insecticides and spraying machinery have been rewritten by R. P. Tew and G. Fletcher, respectively. The notes on most of the fruit Aphids were prepared by G. H. L. Dicker. The chapter on beneficial and harmless insects, especially the part of it devoted to predators, has been extended to include some of the preliminary findings obtained during the studies on the arthropod fauna of orchards recently begun under the leadership of the author in southern England [cf. 42 130].

LÓPEZ CRISTÓBAL (U.). **Preservación de granos almacenados. Nueva técnica con los plaguicidas sintéticos.** [The Preservation of stored Grain. A new Technique with the synthetic Insecticides.]—Rev. Fac. Agron. Eva Perón (3) **29** pt. 1 pp. 85–106, 3 figs., 8½ pp. refs. Eva Perón, 1953.

Calandra oryzae (L.) is the chief pest of stored grain in Buenos Aires and the north-east of Argentina and also infests cereal crops in the field. In laboratory rearing experiments in 1950–51, six generations developed in the year, two in September–December, three in January–April, when the egg, larval and pupal stages lasted 5–10, 10–30 and 6–16 days, respectively, and the adults survived for 15–32 days, and one in late April and May. Eggs were not laid in field grain until late November, when females of the second generation oviposited in the ripening ears. Adults of the last generation overwintered, but mortality was high in both sexes, and the females did not oviposit until September. However, grain taken from store in winter contained larvae in all instars and also pupae, indicating that development is continuous in grain stored in bulk, with at least one further generation during the winter.

Methods of controlling pests in stored grain are reviewed, and a technique devised by the author is described. Pieces of paper, less than $\frac{1}{2}$ in. in diameter, are immersed for four hours in a solution of 2 per cent. γ BHC as lindane in deodorised gas oil, a method of preparing which is given, and allowed to dry for 72 hours. They are then mixed evenly with the grain at a rate of $1\frac{1}{2}$ lb. per 500 lb. small grain or 2 lb. per 500 lb. maize. Insects die after contact with the treated paper, which has a fumigant action for the first fortnight and maintains its effectiveness for three months. This method proved effective against all the grain pests tested, but the grain should be free from dust as this adheres to the paper and reduces its efficiency.

PAPERS NOTICED BY TITLE ONLY.

RISBEC (J.). **Les diptères nuisibles au riz de Camargue au début de son développement.**—Rev. Path. vég. **30** fasc. 4 pp. 211–227, 44 figs. Paris, 1951. [Cf. R.A.E., A **42** 132.]

CHIAROMONTE (A.). **Occurrence of the Cotton Pink Bollworm [*Platyedra gossypiella* (Saund.)] in Eritrea.**—FAO Plant Prot. Bull. **2** no. 3 pp. 41–42, 2 refs. Rome, 1953. [Cf. R.A.E., A **42** 229.]

Summary of the Regulations relating to the Restrictions on the Importation into Mauritius and the Dependencies of Plants, Animals and Animal Products.—Bull. Dep. Agric. Mauritius no. 88, [3+] 8 pp. Port Louis, 1953.

MAY (A. W. S.). **Queensland Host Records for the Dacinae (fam. Trypetidae).**—Qd J. agric. Sci. **10** no. 1 pp. 36–79, 5 figs., 6 refs. Brisbane, 1953; also as Bull. Div. Pl. Ind. Dep. Agric. Qd no. 66, 44 pp., 5 figs., 6 refs. Brisbane [1953].

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